

KEUFFEL & ESSER CO.

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A SELECTION OF
K & E
DRAWING AND TRACING
PAPERS

No. 172—*Alba*
REG. U. S. PAT. OFF.

No. 175L—*Economy*—Thin
REG. U. S. PAT. OFF.

No. 177—*Torine*—Medium
TRADE MARK

No. N182—BANKNOTE—Medium
TRADE MARK

No. 180—**K & E BOND**—Medium
REG. U. S. PAT. OFF.

No. 180L—**K & E BOND**—Light
REG. U. S. PAT. OFF.

No. 198—*Crystalline*—Medium
TRADE MARK

No. 197A—*Ionic*—Light
REG. U. S. PAT. OFF.

No. 197M—*Ionic*—Medium
REG. U. S. PAT. OFF.

No. 26—*Normal*
REG. U. S. PAT. OFF.

No. 50—*Duplex*
REG. U. S. PAT. OFF.

No. 21—*Paragon*
REG. U. S. PAT. OFF.

g Bell

KEUFFEL & ESSER CO.

GENERAL OFFICE & FACTORIES

HOBOKEN, N. J.

NEW YORK,

PARENT HOUSE 127 FULTON STREET

UPTOWN STORE 60 E. 42ND STREET

BRANCHES

CHICAGO 516-20 S. DEARBORN STREET

ST. LOUIS 817 LOCUST STREET

SAN FRANCISCO 30-34 SECOND STREET

DETROIT 77 W. ELIZABETH STREET

MONTREAL 7-9 NOTRE DAME ST. W.

*Henry J. Meyer, Sec. Gen.
317 S. W. Fifth St.
Portland*

PRICE LIST OF CATALOGUE

38th EDITION

IMPORTANT NOTICE

The prices of the articles listed in this Catalogue are contained in a separate price list attached to the inside of the back cover.

Revised price lists will be issued from time to time as necessary; so that our customers, in referring to these lists, should make sure that they have the latest issue.

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KEUFFEL & ESSER CO.

NEW YORK
1869



CHICAGO
1883



GRAND PRIZE

GOLD MEDAL



ST. LOUIS
1904



CATALOGUE of

KEUFFEL & ESSER CO.

MANUFACTURERS AND IMPORTERS

DRAWING MATERIALS

SURVEYING INSTRUMENTS

MEASURING TAPES



SAN FRANCISCO
1915



TRADE MARK

NEW YORK



PORTLAND
1905

PARENT HOUSE
127 FULTON ST.

UPTOWN STORE
60 E. 42ND ST.

GENERAL OFFICE AND FACTORIES, HOBOKEN, N. J.

BRANCHES:

CHICAGO 516-520 S. DEARBORN ST.

ST. LOUIS: 817 LOCUST ST

SAN FRANCISCO: 30-34 SECOND ST

MONTREAL: 7-9 NOTRE DAME ST., WEST



PHILADELPHIA
1876



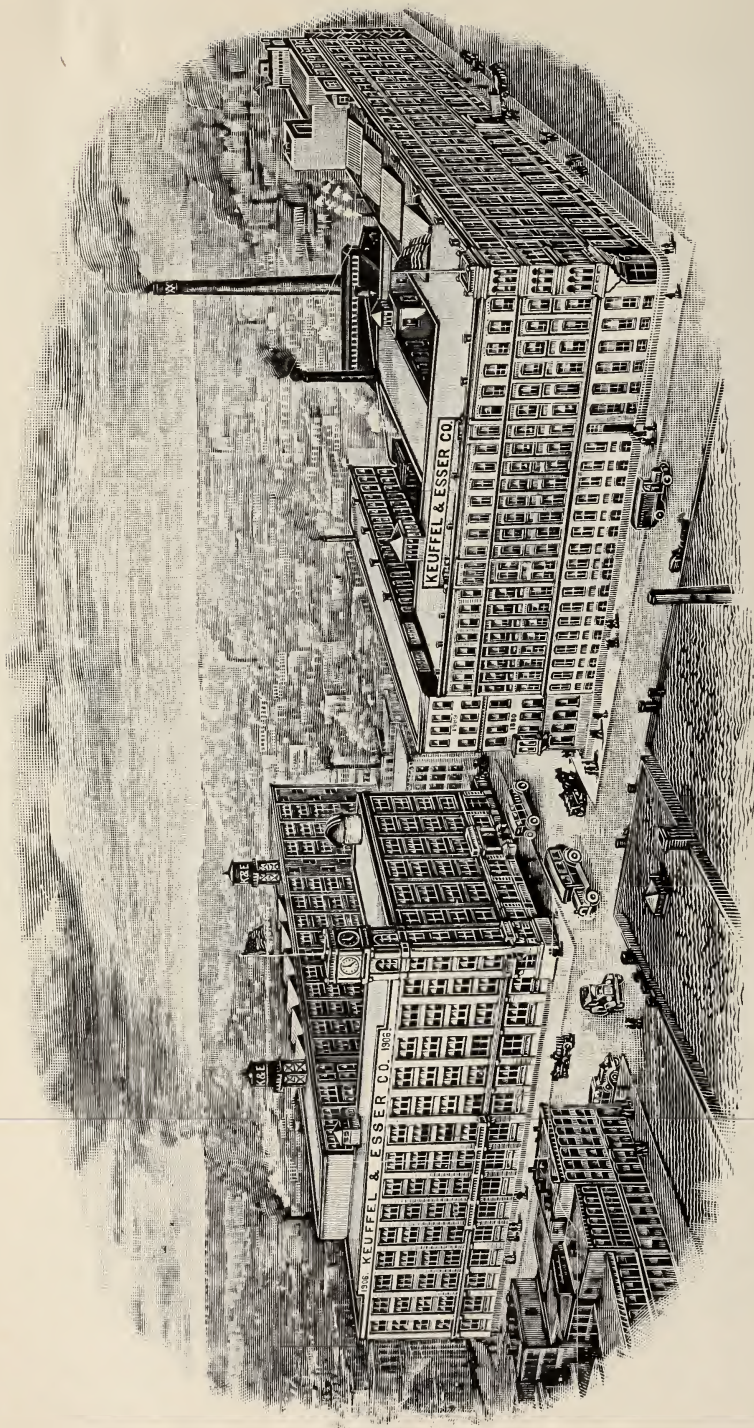
**FOUNDED
1867**

38th EDITION



CHICAGO
1893





GENERAL OFFICE AND FACTORIES, HOBOKEN, N. J.



NEW YORK
PARENT HOUSE
127 Fulton St.



CHICAGO
516-520 S. Dearborn St.



ST. LOUIS
817 Locust St.



SAN FRANCISCO
30-34 Second St.



MONTREAL
7-9 Notre Dame St.
WEST



BRANCH HOUSE FACILITIES

The **K & E** factory, shown on page II, is the largest and best equipped in this line. The goods which bear the **K & E** name and trademarks are manufactured there, except in the case of some papers and drawings instruments which are made in Europe exclusively for us.

The **K & E** New York establishment at 127 Fulton Street includes the Retail, City Order and Blueprint Departments, which occupy the entire building. Another store is located at 60 E. 42nd Street. This new establishment, with its blueprinting plant, has proved to be a great convenience to our uptown customers.

We maintain Branches in **Chicago, St. Louis, San Francisco and Montreal**, each of which carries an ample line of our goods. All of them are equipped with modern plants for preparing Blueprint and Brownprint papers, so that orders can be filled immediately from freshly prepared stock. Workshops are maintained at each Branch for making repairs to the instruments which we manufacture and distribute.



February, 1936.

TO OUR PATRONS:

In presenting the 38th edition of our General Catalogue, our thanks are extended to the thousands of customers in all parts of the world who have done so much to make "K & E" an engineering tradition. It is our hope that this volume, like previous editions, will be more than a catalogue — a constant standard for the needs of the profession. For almost seventy years **K & E CO.** have maintained a reputation for the absolute reliability of their products, and for fairness and good will in their relations with their customers. It will be our endeavor to maintain the high standard of quality and service that "K & E" has come to mean.

Throughout past years the suggestions and comments of our patrons have proven invaluable. We urge you to continue this co-operation, so that through knowing your needs we may learn to serve you better. We will be glad to consider any comment or suggestion, for it is our aim to satisfy our patrons in every respect.

If you would like additional information concerning any of the instruments or supplies of our manufacture, it will be our pleasure to hear from you to that effect at any time.

Sincerely,

KEUFFEL & ESSER CO.

KEUFFEL & ESSER CO., NEW YORK

NOTICE.

This 38th edition of our catalogue supersedes all previous editions.

The prices in the supplemental price list published from time to time are Net Cash in New York, Chicago, St. Louis, and are subject to change without notice. For our branches in San Francisco, Cal., and Montreal, Canada, separate price lists are issued.

In ordering from this Catalogue, it is necessary to give the number, and in some cases the sub-number, size, color, etc., of the article desired.

Remittances can be made either by bank-draft, payable to our order; by Cash sent through any of the Express Companies; or by Post-Office or Express Money Order. If Cash is sent by mail, the letter should be registered.

Remittances in all cases are at the risk of the sender.

For special goods to be made to order and not listed by us, payment is invariably required when the order is placed.

Where goods are ordered to be sent by express, C. O. D., **express charges for collection will be added to the amount of the bill.** By sending full remittance with the order, buyers will save the charges for collecting the amount of the bill, and will avoid delay in delivery.

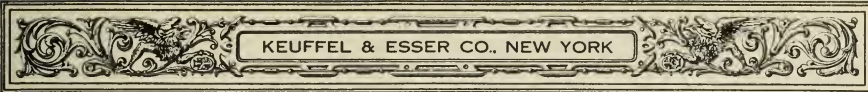
For parcel post shipments, postage at the established rates must be added to the price of goods so ordered. Shipments are insured at the following rates:

INSURED		COLLECT-ON-DELIVERY	
Amount of Insurance	Insurance Fee	Amount of Insurance	Insurance Fee
From \$ 0.01 to \$ 5....	5 cents	From \$ 0.01 to \$ 5....	12 cents
" \$ 5.01 to \$ 25....	10 "	" \$ 5.01 to \$ 25....	17 "
" \$ 25.01 to \$ 50....	15 "	" \$ 25.01 to \$ 50....	22 "
" \$ 50.01 to \$100....	25 "	" \$ 50.01 to \$100....	32 "
" \$100.01 to \$150....	30 "	" \$100.01 to \$150....	40 "
" \$150.01 to \$200....	35 "	" \$150.01 to \$200....	45 "

The amount collected from the addressee includes the fee for the post-office money order, by means of which remittance is made. The C. O. D. fee also covers insurance.

As every precaution is used in packing goods, no allowance can be made if goods be damaged in direct shipment or enclosure, through other houses.

Boxes, which may be required for packing, will be charged at cost.



KEUFFEL & ESSER CO., NEW YORK

IMPORTANT NOTICE REGARDING OWNERSHIP OF GOODS IN TRANSIT.

In order that there may be no misunderstanding relative to the ownership of goods which are in transit between buyer and seller, the following points are called to attention:

When goods are sold f. o. b. shipping point the title passes to the consignee. The consignor's responsibility for delivery or damage ceases, as soon as he obtains a receipt from the Transportation Company. Responsibility for their non-delivery rests with the Transportation Companies. The goods, therefore, must be paid for in accordance with agreed terms, even though they have not reached their destination.

Claims against the Transportation Companies must be made **by the consignee**. When requested we will furnish the necessary documents for making these claims. The Express Companies limit to **four months**, and the Freight Companies to **six months**, the period within which claims must be made; and this period **dates from the day of shipment**. The fact that notice has been given to the Transportation Company that the goods have not been delivered, and that a request has been made to trace them, does not serve to extend the period within which claims for damages or loss may be made.

KEUFFEL & ESSER CO., NEW YORK

CAUTION

It is called to the attention of our patrons that drawing and tracing papers are being offered under names very similar to our **trade mark** names, for the evident purpose of misleading the purchaser and making possible the substitution of spurious goods.

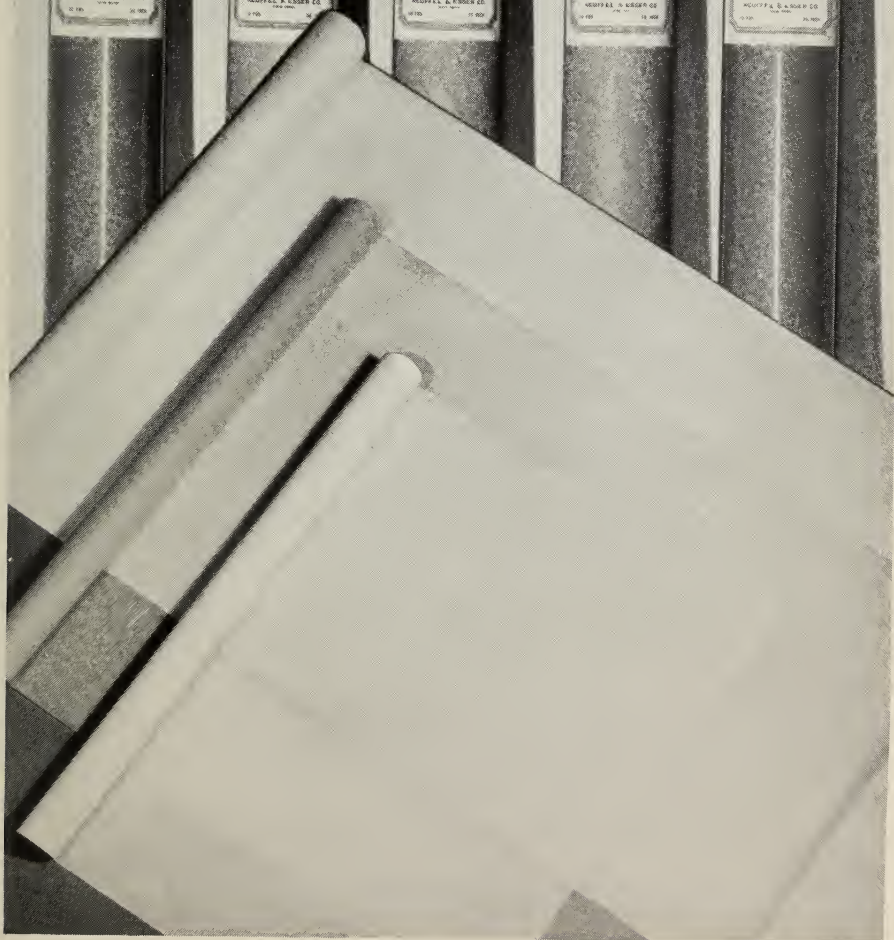
Notice is hereby served that we will proceed vigorously against any infringements of our trade marks.

The following is a list of the Drawing and Tracing Papers and Cloths described in this Catalogue.

CAT. No.				CAT. No.			
NEW	OLD	NAME	PAGE	NEW	OLD	NAME	PAGE
20	7, 75	Paragon	5	123H	116½	Paragon	21
20H	76	"	5	126	105	Normal	22
21	8, 71	"	6	127	101	Universal	22
21H	72	"	6	128	100	"	22
22	9, 82	"	6	131	130	Whatman's	22
23H	7½, 76½	"	6	140	103	Duplex	23
26	5, 60	Normal	7	150	150	Excelsior	24
27	4½, 56	Universal	8	156	156	Imperial	24
28	4, 55	"	9	158	158	Arkwright	24
29		"	9	N159	159	Warwick	24
31	1	Whatman's	10	160	157	Prudence	24
32	2	"	10	N163		Imperial Pencil	25
33	3	"	10	N163½		"	25
35TX	91X	Parchmine	11	164		Arkwright Pencil	25
35X	92X	"	11	167		"	25
36X	94X	Columbia	11	169H	238	Columbia	25
38	15	K & Ledger	12	169L	238L	"	25
38L	15½	"	12	172	172	Alba	29
42	17	Bristol	13	173	173	Bianca	29
50	10, 50	Duplex	14	175	175	Economy	30
51	11, 51	"	15	176L	176L	Ecco	30
52	52	"	15	177		Torrine	31
58, 58L	48, 48L	Simplex	16	178	178	Lucine	31, 32
58H	49	"	17	178-11	353A	"	32
64	40	Manila	17	179T	179	Popular	32
110	122	Alumount	18	180	180	K & E Bond	12, 33
117	125	Paragon Board	18	N182	N182	Banknote	34
120	115, 135	Paragon	19	185	185	Ferrine	34
120-2	137	"	19	187	187	Lotus	35
120H	116	"	20	192	192	Abacus	35
121	111, 135	"	20	193	193	Doric	36
121-2	137	"	20	196	196	Ionic	36
121H	112	"	20	197	197	"	37
N122	118, 139	"	21	198		Crystalline	38
N122-2		"	21	199		Herculine	38
N122-3	139½	"	21				

K & E

P A P E R S





K & E
REG. U. S. PAT. OFF.

DRAWING AND TRACING PAPERS.

DRAWING PAPER.

The draftsman, when judging drawing papers, finds the following points of primary importance:

- (a) Body (thickness, grade and color);
- (b) Surface;
- (c) Erasing Quality;
- (d) Permanency.

(a) **Body.** The customary thickness of drawing paper is such that, unless of very inferior quality, its tearing strength is sufficiently high to readily withstand the handling which it ordinarily receives, either in the drawing room or the shop. Whether it will retain its strength and color as time progresses is a matter which cannot be readily ascertained by the draftsman (since a chemical analysis is required) who, in this respect, had best rely upon the reputation of the house from which he purchases.

The grade and color of the paper to be selected will depend upon the kind of drawing that is to be made. For fine drawings a clear white paper of the highest quality is usually selected; while for detail drawings, which may be subjected to considerable handling, a tinted paper which does not show the effects of soiling may be preferred. In either case the grade or quality of the paper selected should depend upon whether the drawings to be made are to have a permanent or temporary character. If they are to be kept for record the paper should be made of 100 per cent rag stock.

(b) **Surface.** The surface of the paper to be employed will depend upon whether the drawing is to remain in pencil, or whether it is to be inked or colored. For pencil drawings a paper with a light tooth is generally preferred. Where many fine ink lines are to be drawn, a smooth surface usually gives the best results, especially if the drawings are to be reproduced by photographic processes. Where color work forms the major portion of the drawing a sandgrain or pebbled surface is generally selected.

(c) **Erasing Quality.** This is measured by the ability of the paper to withstand the repeated erasures of both ink and pencil lines over the same spot, and still admit of drawing clear, sharp ink lines over the erasures.

(d) **Permanency.** The permanency of the paper depends not only upon the quality of the material from which it is made, but also upon experienced control of the manufacturing processes. Consequently, while high-grade drawing paper can be made only of high-grade material, it is also true that without experienced control in manufacture high-grade material will not produce good drawing paper. It is due to the lack of experience in the manufacture of drawing papers, that paper mills noted for the production of high-class papers for other purposes have failed in their efforts to produce a satisfactory drawing paper.

Our drawing papers have been made by the same mills for more than sixty years. Their uniform excellence has won for them the enviable reputation which is exemplified in the brands of *Paragon*, *Normal*, *Duplex*, etc. The quality of these papers is further guaranteed by our own paper-testing laboratory, equipped with every modern facility, in which every run of paper which reaches us is carefully examined. By this means the standard fixed between us and the factory is strictly maintained; and our customers guaranteed that once having selected a paper suitable for their purpose, they can absolutely depend upon receiving the very same article year after year.

All of these papers are made solely and specifically for us, and can be obtained only from us and our authorized dealers.

Each of the papers listed in this Catalogue possesses certain special and distinctive features, which are set forth accurately as an aid to the purchaser in making a selection suitable to his particular requirements. No two of the papers possess identically the same characteristics, nor are different designations and descriptions applied to the same paper with a view to making an apparent increase in the assortment.

The assortment described in this Catalogue has been made as the result of a careful study of the draftsman's needs over a period of more than sixty years. It is comprehensive enough to answer every purpose, without being so voluminous as to render proper selection difficult.

We shall be glad to furnish, free of charge, upon application, our 16 page booklet, entitled—

“Quality and Testing of Drawing, Tracing and Blueprint Papers”.



WHITE DRAWING PAPERS

Paragon PAPERS

REG. U. S. PAT. OFF.

SHEETS STAMPED



ROLLS WATERMARKED *Paragon* REG. U. S. PAT. OFF.



Very strong clear white papers of 100% highest grade rag stock, and hard sized. The erasing quality is perfect, since sharp ink lines can be drawn over repeated erasures to the last layer of fibres. Surface: Nos. 20 and 20H, finely grained; No. 23H, finely grained, but not as hard sized as the others, being made especially for water color work; Nos. 21 and 21H, pebbled; No. 22, smooth, water-resisting, and especially suitable for outdoor work, in which it is used extensively for plane-table mapping by the U. S. Government. Nos. 20, 20H, 21, 21H and 23H take pencil, ink and water colors, and do not become wavy when water colors are applied. Thickness: Nos. 20 and 21, about 110/120;* Nos. 20H, 21H and 23H, about 150;* No. 22 about 110.*

Paragon

Finely grained surface. Heavy.

SHEETS

per ream

per quire

20. Royal 19 × 24 in.
Imperial 22 × 30 "

ROLLS width in inches

36

42

58

72

20. 10 yards per roll

- 20P. 40 to 50 lbs . . . per pound

No. 20 is old No. 7 in sheets and No. 75 in rolls.

Paragon

Finely grained surface. Extra Heavy.

ROLLS width in inches

42

58

- 20H. 10 yards per roll

- 20HP. 40 to 50 lbs . . . per pound

No. 20H is old No. 76.

*The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thicknesses of the papers.



WHITE DRAWING PAPERS

Paragon PAPERS

REG. U. S. PAT. OFF.

(CONTINUED)

SHEETS STAMPED  ROLLS WATERMARKED *Paragon* REG. U. S. PAT. OFF.

Paragon

Pebbled surface. Heavy.

SHEETS

per ream

per quire

21. Royal 19 × 24 in.
Imperial 22 × 30 "

ROLLS width in inches

36

42

58

21. 10 yards per roll

- 21P. 40 to 50 lbs. . . . per pound

No. 21 is old No. 8 in sheets and No. 71 in rolls.

Paragon

Pebbled surface. Extra Heavy.

ROLLS width in inches

58

- 21H. 10 yards per roll

- 21HP. 40 to 50 lbs. . . . per pound

No. 21H is old No. 72.

Paragon

Water-resisting, smooth surface. Heavy.

SHEETS

per ream

per quire

22. Royal 19 × 24 in.
Imperial 22 × 30 "

ROLLS width in inches

36

42

62

22. 10 yards per roll

- 22P. 40 to 50 lbs. . . . per pound

No. 22 is old No. 9 in sheets and No. 82 in rolls.

Paragon

For water color work, finely grained surface. Extra Heavy.

SHEETS

per ream

per quire

- 23H. Imperial 22 × 30 in.

ROLLS width in inches

42

58

- 23H. 10 yards per roll

- 23HP. 40 to 50 lbs. . . . per pound

No. 23H is old No. 7½ in sheets and No. 76½ in rolls.



WHITE DRAWING PAPERS

Normal PAPER
REG. U. S. PAT. OFF.

SHEETS STAMPED  ROLLS WATERMARKED *Normal* REG. U. S. PAT. OFF.



A very strong white paper with very smooth, calendered surface, of 100% highest grade rag stock and hard sized. The erasing quality is perfect. Sharp ink lines can be drawn over repeated erasures to the last layer of fibres. For a Drawing Paper it has very high tearing and folding quality. Sheets and rolls are of thickness 80.*

An exceptionally high grade paper for the most complicated fine line drawings. Its high strength and pure rag stock make it a most excellent sheet for record line drawings or working drawings subject to rough handling. Highest grade paper for mechanical drawing.

<i>Normal</i>				
SHEETS		per ream	per quire	
26.	Royal	19 × 24 in.		
	Imperial	22 × 30 "		
	Double Royal	24 × 36 "		
	Double Elephant	27 × 40 "		
ROLLS width in inches		36	42	62
26.	10 yards	per roll		
26P.	35 to 40 pounds	per pound		
No. 26 is old No. 5 in sheets and No. 60 in rolls.				

*The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thicknesses of the papers.




WHITE DRAWING PAPERS

Universal PAPERS
REG. U. S. PAT. OFF.



Reduced fac-similes of the label of Universal Paper in Sheets.

SHEETS STAMPED  ROLLS WATERMARKED *Universal* REG. U. S. PAT. OFF.
(except No. 29)



Strong, natural white papers containing a high percentage of clean rags. The erasing quality is very good, since sharp ink lines can be drawn over repeated erasures. Surface: No. 27, smooth; No. 28, finely grained; No. 29, rough. All these papers take pencil, ink and water-colors; but owing to its smooth surface, No. 27 is especially suitable for fine ink line work, whereas No. 29, because of its rough (torchon) surface, is especially recommended for water-color work. Hence No. 27 is recommended to schools for mechanical drawing; No. 28 for all round use, and No. 29 for very bold drawing, sketching and wash drawings. Thickness: No. 27, sheets and rolls, 100;* No. 28, Cap, Demy, Medium, 58;* Royal, Imperial, 65;* Double Elephant and roll paper, 85;* No. 29, about 180.*

Universal

Smooth surface. Heavy.

SHEETS

per ream

per quire

- | | | |
|-----|------------------|-------------|
| 27. | Royal | 19 × 24 in. |
| | Imperial | 22 × 30 " |
| | Double Royal . . | 24 × 36 " |
| | Double Elephant | 27 × 40 " |

ROLLS width in inches

36

42

- | | | |
|------|---------------------|-----------|
| 27. | 10 yards | per roll |
| 27P. | 35 to 40 pounds . . | per pound |

No. 27 is old No. 4½ in sheets and No. 56 in rolls.



WHITE DRAWING PAPERS

Universal PAPERS
REG. U. S. PAT. OFF.

(CONTINUED)

Universal

Finely grained surface. Thickness changes with size.

SHEETS		per ream	per quire
28.	Cap $13\frac{1}{2} \times 17$ in.		
	Demy 15×20 "		
	Medium 17×22 "		
	Royal 19×24 "		
	Imperial 22×30 "		
	Double Elephant 27×40 "		

Universal

Finely grained surface. Medium.

ROLLS width in inches		36	42	62
28.	10 yards per roll			
28P.	35 to 40 pounds. . per pound			

No. 28 is old No. 4 in sheets and No. 55 in rolls.

Universal

Rough (Torchon) surface. Extra Heavy.

ROLLS width in inches		60
29.	10 yards per roll	
29P.	35 to 40 pounds . . per pound	

*The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thicknesses of the papers.

KEUFFEL & ESSER CO., NEW YORK

WHITE DRAWING PAPERS

WHATMAN'S HAND-MADE PAPERS

EACH SHEET WATERMARKED "WHATMAN" OR "WHATMAN TURKEY MILLS"

WHATMAN Drawing Papers are of a clear white color. The two classes, **SELECTED BEST** and **RETREE**, in which these papers are carried, are made as one quality, and the sheets afterward examined and separated at the mill. The sheets without imperfections are called **SELECTED BEST**. Whatman Papers are made with three different styles of surface.

HP., signifying "**Hot Pressed**," a calendered surface changing from very smooth in the thin sheets to a fairly smooth grained surface in the thick sheets. mostly used for pencil and fine line drawings.

N., signifying "**Not Hot Pressed**," the surface changing from finely grained in the thin sheets to heavily grained in the thick sheets. Used for general purposes and water-color drawing.

R., signifying "**Rough**," (Torchon Paper), a very coarsely grained surface; used for very bold drawing, sketching and water-color drawing.

The thickness of Whatman Papers changes with the size of the sheet and runs 40* in the **Hot Pressed Cap No. 31**, to about 80* in the **Hot Pressed Double Elephant No. 31**. Sheets of "**Not Hot Pressed**" **No. 31** surface are about 25% thicker. The extra heavy Paper **No. 33** is about 100-120* for the **Hot Pressed** and about 140-150* for the **Not Hot Pressed**.

31 H P. and 31 N. Whatman's Retree

with HP or N surface.		weight per ream	per ream	per quire
Demy	15 × 20 in.	lbs. 25		
Royal	19 × 24 "	44		
Imperial . . .	22 × 30 "	72		
Double Elephant	27 × 40 "	133		

31 A H P. and 31 A N. Whatman's Selected Best

with HP or N surface.		
Imperial . . .	22 × 30 in.	72
Double Elephant	27 × 40 "	133

32. Whatman's Retree

with R surface.		
Royal	19 × 24 in.	44
Imperial . . .	22 × 30 "	72
Double Elephant	27 × 40 "	133

33 H P. and 33 N. Whatman's Selected Best

with HP or N surface.		
Imperial . . .	22 × 30 in.	140

Nos. 31 HP to 33N are old Nos. 1 HP to 3N.

*The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thicknesses of the papers.



WHITE DRAWING PAPERS

PARCHMINE DRAWING PAPERS

TRADE MARK

EACH ROLL WATERMARKED "PARCHMINE 100% RAG".

Exceptionally strong white papers with smooth surface, of 100% rag stock, hard sized. The erasing quality is fairly good. They possess unusually high tearing and folding quality and will withstand almost any amount of rough handling. No. 35TX is of thickness 30*; No. 35X of thickness 43*.

Parchmine Papers are suitable for pencil and ink line drawings subject to filing, folding, and rough handling, especially where the heavier regular drawing papers are too voluminous. No. 35TX can be used for making blue prints from heavy pencil or ink lines.

PARCHMINE

Thin

ROLLS	width in inches	30	36	42	54
35TX. 50 yards	per roll				

No. 35TX is old No. 91X.

Medium

ROLLS	width in inches	24	30	36	42	54
35X. 50 yards	per roll					

No. 35X is old No. 92X

Columbia DRAWING PAPERS

REG. U. S. PAT. OFF.

EACH ROLL WATERMARKED **K & E Co. Columbia** REG. U. S. PAT. OFF.

Very strong natural white paper with finely grained surface, of 100% rag stock, and hard sized. The erasing quality is good; ink lines can be erased without roughening the surface. No. 36X is of thickness 50*.

While this Paper is not made for drawing purposes, it is often used for pencil and even ink line drawings when very high erasing quality is not required. The tearing and folding qualities are better than those of regular drawing papers of equal weight.

Columbia

Medium

ROLLS	width in inches	30	36	42
36X. 50 yards	per roll			

No. 36X is old 94X.

While the above papers are not regularly carried in sheets, prices will be quoted on sheets of any size cut from rolls.

*The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thicknesses of the papers.

KEUFFEL & ESSER CO. NEW YORK

WHITE DRAWING PAPERS

K & E LEDGER PAPERS

REG. U. S. PAT. OFF.

Very strong white ledger papers of very smooth surface, of 100% rag stock, and hard sized. The erasing quality is very good. No. 38 is of thickness 55*, and No. 38L of thickness 36*.

K & E Ledger Papers are of excellent quality and can be used for the purposes indicated by the name. They can also be used as drawing paper for pencil and ink work.

K & E LEDGER

Heavy

SHEETS

per ream

per quire

38. Medium 17 × 22 in.

Double Royal . 24 × 36 "

Medium Weight

SHEETS

38L. Double Royal . 24 × 36 in.

Nos. 38 and 38L are old Nos. 15 and 15½.

K & E BOND PAPER

REG. U. S. PAT. OFF.

Clear white paper with fairly smooth surface, of 100% rag stock of most unusual strength and cleanness, and hard sized. The erasing quality is perfect. This paper possesses unusually high tearing and folding quality and will withstand almost any amount of rough handling. It is sufficiently transparent to be used for tracing; and blueprints can be made from it. Thickness 28*.

K & E Bond Paper is recommended very highly for drawings to be kept as records subject to rough handling. This Paper will not deteriorate with age and lasts indefinitely.

K & E BOND

SHEETS

per ream

per quire

180H. Double Royal 24×36 in.

Double Elephant . . 27×40 "

K & E BOND

ROLLS width in inches

36

42

180H. 20 yards per roll

180HX. 50 yards " "

Thinner and more transparent K & E Bond Papers No. 180 & 180L are listed under Tracing Papers. See Page 33.

*The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thicknesses of the papers.



WHITE DRAWING PAPERS.

BRISTOL BOARDS.



Stamped with Trade Mark



BLANK (NOT PRINTED).

Reynolds' Bristol Board.

White, smooth surface.

42-2. (2 ply) Blank, (not printed).

42-3. (3 ply) " " "

42-4. (4 ply) " " "

42-2 42-3 42-4
(2 ply) (3 ply) (4 ply)

Trade Mark	8 × 13 in.	per doz. . .	*
		per gross . .	*
Patent Office	10 × 15 in.	per doz. . .	*
		per gross . .	*
Cap	12½ × 15¼ "	per doz. . .	
		per gross . .	
Demy . . .	14½ × 18¼ "	per doz. . .	
		per gross . .	
Medium . .	16½ × 20¾ "	per doz. . .	
		per gross . .	
Royal . . .	18¼ × 22¾ "	per doz. . .	
		per gross . .	
Imperial . .	21½ × 28¾ "	per doz. . .	*
		per gross . .	*

*Not carried in stock.

PRINTED (WITH BORDER, ETC.).

Reynolds' Bristol Board. Printed (with border, etc.), for U. S. Patent and Trade Mark Office drawings. gross doz.

42S. Trade Mark, 8 × 13 in., 3 ply . .

42P. Patent Office, 10 × 15 " 3 " . .

42SL. Trade Mark, 8 × 13 " 2 " . .

42PL. Patent Office, 10 × 15 " 2 " . .

Nos. 42-2 to 42PL are old Nos. 17-2 to 17PL.



COLORED DRAWING PAPERS.

Duplex PAPERS

REG. U. S. PAT. OFF.

EACH SHEET STAMPED  ROLLS WATERMARKED *Duplex* REG. U. S. PAT. OFF.



Very strong cream colored drawing papers, with the exception of No. 52 which is green, of 100% rag stock and hard sized. All of these papers have a finely grained surface. The erasing quality is perfect. Sharp ink lines can be drawn over erasures to the last layer of fibres. Nos. 50 and 52 are of thickness 80"; Nos. 51 is of thickness 85".

Duplex as a detail paper stands in a class by itself. It is so well known that it hardly requires description. Owing to its pure and strong stock and its unequaled erasing quality, it is highly recommended for difficult line and record drawings. Schools and Colleges prefer Duplex because it will always have a neat appearance even after repeated erasures and considerable handling.

CREAM

Duplex

Cream. Medium.

SHEETS

50.	Royal	19 × 24 in.
	Imperial . . .	22 × 30 "
	Double Royal .	24 × 36 "
	Double Elephant	27 × 40 "

No. 50 in sheets is old No. 10.

per ream per quire

Duplex

Cream. Medium.

ROLLS width in inches

		30	36	42	56	62
50.	10 yards	per roll				
50X.	50 "	per roll				
50P.	35 to 40 pounds . .	per pound				

*The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thicknesses of the papers.



COLORED DRAWING PAPERS



Duplex PAPERS
REG. U. S. PAT. OFF.

(CONTINUED)

CREAM

Duplex

Cream. Heavy.

SHEETS

per ream

per quire

51. Imperial . . . 22 × 30 in.

Double Royal . 24 × 36 "

Double Elephant 27 × 40 "

No. 51 in sheets is old No. 11.

Duplex

Cream. Heavy.

ROLLS width in inches

36

42

62

51. Rolls of 10 yards . . . per roll

51X. " " 50 . . . per roll

51P. 35 to 40 pounds . . per pound

GREEN

Duplex

Green. Medium.

ROLLS width in inches

30

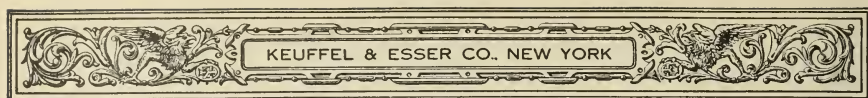
36

42

52. 10 yards . . . per roll

52P. 35 to 40 pounds . . per pound

*The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thicknesses of the papers.



BUFF DETAIL PAPERS

SIMPLEX PAPERS

REG. U. S. PAT. OFF.

EACH ROLL MARKED **SIMPLEX**

Strong dark buff detail drawing papers with finely grained surface, of stock free from ground wood, and as clean as a paper of this type can be made. Ink lines erase fairly well. The papers are very tough and will stand folding to a considerable extent. No. 58L is of thickness 55-60*; No. 58 of thickness 70-80*; and No. 58H of thickness 90-100*.

Simplex Detail Drawing Papers are made specially for us, and possess drawing paper qualities so far as they are obtainable in such papers. We recommend them for rough pencil and detail work of temporary character.

SIMPLEX

Light.

SHEETS

	per ream	per quire
58L. Imperial . . . 22 × 30 in.		
Double Royal . 24 × 36 "		
Double Elephant 27 × 40 "		

ROLLS width in inches

36 42

- 58L. 10 yards . . . per roll
 58LX. 50 yards . . . per roll
 58LP. 50 pounds . . . per pound

No. 58L is old No. 48L.

SIMPLEX

Medium.

SHEETS

	per ream	per quire
58. Imperial . . . 22 × 30 in.		
Double Royal . 24 × 36 "		
Double Elephant 27 × 40 "		

ROLLS width in inches

30 36 42 48 54

58. 10 yards . . . per roll
 58X. 50 yards . . . per roll
 58P. 50 pounds . . . per pound

No. 58 is old No. 48.

*The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thicknesses of the papers.



BUFF DETAIL PAPERS

SIMPLEX PAPERS

REG. U. S. PAT. OFF.

(CONTINUED)

EACH ROLL MARKED **SIMPLEX**

SIMPLEX

Heavy.

SHEETS

per ream

per quire

- 58H.** Imperial . . . 22 × 30 in.
 Double Royal . 24 × 36 "
 Double Elephant 27 × 40 "

ROLLS width in inches

36

42

48

54

58H. 10 yards . . . per roll

58HX. 50 yards . . . per roll

58HP. 50 pounds . . . per pound

No. 58H is old No. 49.

MANILA PAPERS

Buff papers with a very smooth highly calendered surface. No. 64-1 is of thickness 100-110*; No. 64-2 of thickness 125-135*, and No. 64-3 of thickness 155-165*. Being made of jute stock they are very tough. These highly calendered smooth manila papers are intended mainly for stencils and patterns, but are occasionally used for rough detail drawings. We, however, do not recommend them for this purpose.

MANILA

Medium.

ROLLS width in inches

36

40

48

54

64-1X. 50 yards . . . per roll

64-1P. 100 pounds . . . per pound

MANILA

Heavy.

ROLLS width in inches

36

40

48

54

64-2X. 50 yards . . . per roll

64-2P. 100 pounds . . . per pound

MANILA

Extra Heavy.

ROLLS width in inches

36

40

48

54

64-3X. 50 yards . . . per roll

64-3P. 100 pounds . . . per pound

No. 64-1 to 64-3 are old Nos. 40-1 to 40-3.

*The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thicknesses of the papers.

KEUFFEL & ESSER CO., NEW YORK

K & E

REG. U. S. PAT. OFF.

MOUNTED DRAWING PAPERS

Alumount SHEETS

TRADE MARK

MOUNTED ON SHEET ALUMINUM

Alumount Sheets, as made for the U. S. Coast & Geodetic Survey and U. S. Geological Survey, have white drawing paper mounted on both sides of an aluminum sheet. The drawing paper employed is of an unusually high quality, and has a smooth surface especially suitable for the finest pen and ink work for photographic reproduction. The erasing quality is excellent. The sheets will not change in dimension with changes of humidity, and are guaranteed against spotting or other chemical effects of the metal.

The following mounted sheets are furnished with the paper overlapping the aluminum plate $\frac{1}{2}$ inch all around, to enable the sheet to be fastened to the board with thumb tacks. The dimensions given are the full size of the sheet.

Alumount SHEETS

- 110A-1. 18 × 24 inches. Aluminum .025 inch thick per sheet
110C-4. 24 × 31 inches. Aluminum .040 inch thick “ “

The following mounted sheets have aluminum plates notched and the paper perforated to accommodate the clamp screws of standard plane table boards. The dimensions given are the full size of the sheet.

Alumount SHEETS

- 110AN-1. 18 × 24 inches. Aluminum .025 inch thick per sheet
110CN-4. 24 × 31 inches. Aluminum .040 inch thick “ “

No. 110A-1 etc. is old No. 122A-1 etc.

Paragon BOARD

REG. U. S. PAT. OFF.

MOUNTED ON MUSLIN

Paragon Board consists of two sheets of Paragon paper, with muslin between and a sheet of Simplex paper, specially treated, mounted on the outside face of one of the Paragon sheets. It forms a flat and hard board which is resistant to changes in atmospheric conditions. For papers mounted on muslin, see page 19.

The drawing surface is Paragon drawing paper No. 21 (pebbled surface), unless No. 20 (finely grained) is ordered.

Paragon BOARD SHEETS

117. Royal 19 × 24 in. per sheet
Imperial 22 × 30 “ “
Double Elephant. 27 × 40 “ “

Intermediate and larger sizes furnished to order.

No. 117 is old No. 125.

KEUFFEL & ESSER CO., NEW YORK

MOUNTED DRAWING PAPERS

MOUNTED ON MUSLIN.

Mounted papers are listed in 10-yard rolls, but any of them can be furnished in 20, 30, 40 or 50 yard rolls, in all widths, at a slight additional advance per yard.

All of these papers, including long rolls and sheets, are mounted on heavy high grade muslin, stretched, and air-dried. The adhesive used for mounting these papers is specially prepared for the purpose, and assures a permanent joint between the paper and muslin, that will not deteriorate with age. Our mounted papers will not separate from the muslin, even under considerable force.

Properly treated air-dried mounted papers are much superior to papers mounted by compression between rollers and dried by passing over heated rollers. The rollers distort and strain the paper and destroy the surface, while drying by heat injures the paper and the adhesive.



To protect our customers against faulty mounting or mounting on inferior muslin, the muslin side of our papers, when mounted by us, is stamped with their trade-mark name and "Keuffel & Esser Co.—Mounted Paper" as shown above.

Paragon Mounted White Drawing Paper.

REG. U. S. PAT. OFF.

No. 120 is No. 20 (100% rag stock) mounted. For description of paper, see page 5.

ROLLS

120.	36 in. wide, per 10 yard roll	per yard
42	" "	" "
58	" "	" "
72	" "	" "

SHEETS

120.	Royal	19 × 24 in.	per sheet
	Imperial	22 × 30 "	"
	Double Elephant.	27 × 40 "	"
	Antiquarian	31 × 53 "	"

No. 120 is old No. 115 in rolls and 135 in sheets.

Paragon Drawing paper in sheets, like No. 120, but **MOUNTED ON BOTH SIDES** of the muslin ("muslin between") for record books, etc.

REG. U. S. PAT. OFF.

SHEETS

120-2.	Royal	19 × 24 in.	per sheet
	Imperial	22 × 30 "	"
	Double Elephant	27 × 40 "	"
	Antiquarian	31 × 53 "	"

No. 120-2 is old No. 137 in sheets.



MOUNTED DRAWING PAPERS

MOUNTED ON MUSLIN.

Paragon Mounted White Drawing Paper.

REG. U. S. PAT. OFF.

No. 120H is No. 20H (100% rag stock) mounted. For description of paper, see page 5.

ROLLS

120H	42 in. wide, per 10 yard roll	per yard
	58 " "	"

No. 120H is old No. 116.

Paragon Mounted White Drawing Paper.

REG. U. S. PAT. OFF.

No. 121 is No. 21 (100% rag stock) mounted. For description of paper, see page 6.

ROLLS

121.	36 in. wide, per 10 yard roll	per yard
	42 " "	"
	58 " "	"

SHEETS

121.	Royal	19 × 24 in.	per sheet
	Imperial	22 × 30 "	"
	Double Elephant	27 × 40 "	"
	Antiquarian	31 × 53 "	"

No. 121 is old No. 111 in rolls and 135 in sheets.

Paragon

REG. U. S. PAT. OFF.

Drawing paper, in sheets, like No. 121 but **MOUNTED ON BOTH SIDES** of the muslin ("muslin between") for record books, etc.

SHEETS

121-2.	Royal	19 × 24 in.	per sheet
	Imperial	22 × 30 "	"
	Double Elephant	27 × 40 "	"
	Antiquarian	31 × 53 "	"

No. 121-2 is old No. 137 sheets.

Paragon Mounted White Drawing Paper.

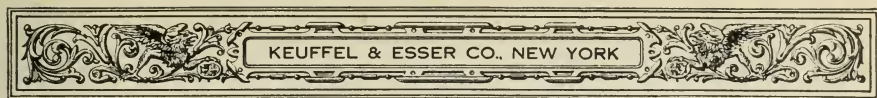
REG. U. S. PAT. OFF.

No. 121H is No. 21H (100% rag stock) mounted. For description of paper, see page 6.

ROLLS

121H.	58 in. wide, per 10 yard roll	per yard
-------	-------------------------------	----------

No. 121H is old No. 112.



MOUNTED DRAWING PAPER

MOUNTED ON MUSLIN.

Paragon Mounted White Drawing Paper. Especially adapted for
REG. U. S. PAT. OFF. Plane Table work.

No. N122 is No. 22 (100% rag stock) mounted. For description of paper, see page 6.

ROLLS

N122.	36 in. wide, per 10 yard roll	per yard
	42 “ “	“
	62 “ “	“

SHEETS

N122.	15 × 15 in.	per sheet
	18 × 24 “	“ “
	24 × 31 “	“ “

No. N122 is old No. N118 in rolls and 139 in sheets.

Paragon Drawing paper in sheets, like No. N122, but **MOUNTED ON**
REG. U. S. PAT. OFF. **BOTH SIDES** of the muslin (“muslin between”) for Plane
Table work, records, etc.

SHEETS

N122-2.	15 × 15 in.	per sheet
	18 × 24 “	“ “
	24 × 31 “	“ “

Paragon Drawing paper in sheets, like No. N122, but **MOUNTED ON**
REG. U. S. PAT. OFF. **BOTH SIDES** of the muslin, with grain of two sheets at right
angle, for Plane Table work; as made for the U. S. Geological
Survey.

SHEETS

N122-3.	15 × 15 in.	per sheet
	18 × 24 “	“ “
	24 × 31 “	“ “

No. N122-3 is old No. 139½.

Paragon Mounted White Drawing Paper.

REG. U. S. PAT. OFF.

No. 123H is No. 23H (100% ragstock) mounted, For description of paper see page 6.

ROLLS

123H.	42 in. wide, per 10 yard roll	per yard
	58 “ “	“

No. 123H is old No. 116½.



MOUNTED DRAWING PAPERS

MOUNTED ON MUSLIN.



Normal Mounted White Drawing Paper.
REG. U. S. PAT. OFF.

No. 126 is No. 26 (100% rag stock) mounted. For description of paper, see page 7.

ROLLS

126.	36 in. wide, per 10 yard roll	per yard
	42 " "	"
	62 " "	"

No. 126 is old No. 105.

Universal Mounted White Drawing Paper.
REG. U. S. PAT. OFF.

No. 127 is No. 27 Mounted. For description of paper, see page 8.

ROLLS

127.	36 in. wide, per 10 yard roll	per yard
	42 " "	"

No. 127 is old No. 101.



Universal Mounted White Drawing Paper.
REG. U. S. PAT. OFF.

No. 128 is No. 28 mounted. For description of paper, see page 9.

ROLLS

128.	36 in. wide, per 10 yard roll	per yard
	42 " "	"
	62 " "	"

No. 128 is old No. 100.

Whatman's Selected Best Drawing Paper, mounted.

No. 131AN is No. 31A with N surface mounted. For description of paper, see page 10.

SHEETS

131AN.	Royal	19 × 24 in.,	Selected Best	per sheet
	Imperial	22 × 30 "	"	"
	Double Elephant .	27 × 40 "	"	"

No. 131AN is old No. 130.

Whatman's Selected Best Drawing Paper, mounted.

No. 131AHP is No. 31A with HP surface mounted. For description of paper, see page 10.

*131AHP.	Royal	19 × 24 in.,	Selected Best	per sheet
	Imperial	22 × 30 "	"	"
	Double Elephant.	27 × 40 "	"	"

*No. 131AHP to order only.



MOUNTED DRAWING PAPERS

MOUNTED ON MUSLIN.



Duplex Mounted Cream Colored Drawing Paper

REG. U. S. PAT. OFF.

No. 140 is No. 50 (100% rag stock) mounted. For description of paper, see page 14.

ROLLS

140.	36 in. wide, per 10 yard roll	per yard
42	" "	"
56	" "	"
62	" "	"

SHEETS

15 × 15 in.	per sheet
18 × 24 "	" "
24 × 31 "	" "

No. 140 is old No. 103.

Duplex Cream Colored drawing paper in sheets like No. 140 but
 REG. U. S. PAT. OFF. **MOUNTED ON BOTH SIDES** of the muslin ("muslin between")
 for Plane Table work, records, etc.

SHEETS

140-2.	15 × 15 in.	per sheet
	18 × 24 "	"
	24 × 31 "	"

MOUNTED SHEETS TO ORDER

The prices for mounted papers in sheets, except **Whatman's papers**, are for muslin trimmed to the size of the sheet. If the muslin on **Paragon** papers is wanted larger than the paper, on one or more edges, this must be specified in the order. Mounting on larger muslin slightly increases the price of the mounted sheet.

Mounted sheets of other sizes than listed above will be furnished to order.

EXTRA LARGE SHEETS

for city, county, mine, etc., maps mounted to order. These are built up of two or more widths of paper. The joining edges are accurately beveled by a special machine and overlapped, producing a hardly perceptible and very durable seam. Our facilities in this line are unequalled. Prices on application.



TRACING CLOTHS

INK TRACING CLOTHS.

EXCELSIOR.

EXCELSIOR Tracing Cloth is extremely transparent, and very uniform. It is, therefore, particularly well adapted for tracing faint or intricate drawings, and cannot be surpassed for tracings which are intended for copying, by the blue, black or brown-printing processes.

150. Excelsior, in rolls of 24 yards, one side glazed, the other dull.
- | | | | |
|--|----|----|-------------|
| | 30 | 36 | 42 in. wide |
|--|----|----|-------------|
- per roll



No. 156.

IMPERIAL.

IMPERIAL Tracing Cloth is the best tracing cloth for all-around use. It has maintained its supremacy for half a century. Time and experience have repeatedly proven that no cloth on the market matches Imperial in its combination of the vital factors constituting tracing cloth quality, i. e., perfect foundation cloth, uniform transparency, drawing surface, and last, but not least, its great resistance to the effects of age. A user of Imperial rests assured that his drawings will not become opaque and brittle.

156. Imperial, in rolls of 24 yards, one side glazed, the other dull.
- | | | | | | | | |
|--|----|----|----|----|----|----|-------------|
| | 24 | 30 | 36 | 38 | 42 | 48 | 54 in. wide |
|--|----|----|----|----|----|----|-------------|
- per roll

ARKWRIGHT.

158. Arkwright, in rolls of 24 yards, one side glazed, the other dull,
- | | | | | |
|--|----|----|----|-------------|
| | 24 | 30 | 36 | 42 in. wide |
|--|----|----|----|-------------|
- per roll

WARWICK.

- N159. Warwick, in rolls of 24 yards, one side glazed, the other dull.
- | | | | |
|--|----|----|-------------|
| | 30 | 36 | 42 in. wide |
|--|----|----|-------------|
- per roll

PRUDENCE.

160. Prudence, in rolls of 24 yards, one side glazed, the other dull.
- | | | | |
|--|----|----|-------------|
| | 30 | 36 | 42 in. wide |
|--|----|----|-------------|
- per roll

No. 160 is old No. 157.

KEUFFEL & ESSER CO., NEW YORK

TRACING CLOTHS

PENCIL TRACING CLOTH.



IMPERIAL

IMPERIAL Pencil Tracing Cloth is the best pencil tracing cloth for all-around use. It differs from Imperial Tracing Cloth only in having a duller surface for pencil. Imperial Pencil Tracing Cloth takes both pencil and ink lines readily. It is carried in two types: No. N163—one side dull, one smooth (not glazed) No. N163½—one side dull, one side glazed.

N163 Imperial Pencil Tracing Cloth, in rolls of 24 yards, one side dull, one side smooth (not glazed).

	30	36	42	48	54 in. wide
per roll					

N163½ Imperial Pencil Tracing Cloth, in rolls of 24 yards, one side dull, one side glazed.

	30	36	42 in. wide
per roll			

ARKWRIGHT

ARKWRIGHT Pencil Tracing Cloth, takes both pencil and ink lines, has one dull and one smooth (not glazed) surface, and has good blueprinting transparency.

164 Arkwright Pencil Tracing Cloth, in rolls of 24 yards, one side dull, one side smooth (not glazed)

	30	36	42 in. wide
per roll			

ARKWRIGHT "WHITE".

ARKWRIGHT "WHITE" Pencil Cloth. Pencil lines erase without leaving traces, takes ink well, high transparency.

167. Arkwright "White" Pencil Cloth. in rolls of 24 yards, one side dull.

	30	36	42 in. wide
per roll			

DRAWING CLOTHS

COLUMBIA

TRADE MARK

A heavy opaque smooth surfaced cloth, suitable for both pencil and ink. It is especially recommended for outdoor and shop work, since it will withstand an unlimited amount of rough handling.

169L. Columbia Drawing Cloth, light weight, opaque

	30	36	42 in. wide
per roll of 10 yards			

169H. Columbia Drawing Cloth, heavy weight, opaque

	30	36	42	54 in. wide
per roll of 10 yards				

Nos. 169L and 169H are old Nos. 238L and 238.



IMPRINTED SHEETS

TRACING CLOTH, PENCIL CLOTH,
DRAWING PAPER, TRACING PAPER.

					KEUFFEL & ESSER CO. NEW YORK DRAWING MATERIALS - MATHEMATICAL AND SURVEYING INSTRUMENTS - MEASURING TAPES					
					NO.	DESCRIPTION	DW.	CK.	DRAWN	DATE
									CHECKED	SCALE
									APPROVED	
REVISIONS										

Any **K & E** Tracing Cloth, Pencil Cloth, Drawing Paper or Tracing Paper can be furnished in sheets, either plain, or imprinted with an opaque, indelible, non-smudging ink that blueprints like drawing ink.

Since dimensions and imprints vary, sheets are furnished to specification only, and the price is determined by the material and labor made necessary by individual requirements. Estimates are gladly furnished; and competent work assured.

A specification form, indicating the details that are essential, will be sent upon request. The layout specified by the customer will be strictly followed in every respect, and a proof submitted for his approval.

First class jobs, suitable for the finest reproduction work, are guaranteed.

Let us give you an estimate on your next order of printed sheets.

Specification form indicating details required, sent on application.

Blanks for ordering Printed Sheets. ADDITIONAL BLANKS WILL BE FURNISHED ON REQUEST.

SPECIFICATIONS FOR PRINTED SHEETS TRACING CLOTH, DRAWING or TRACING PAPERS.

Please read all questions and answer all that apply to the sheets wanted.

Number of sheets wanted

Kind of cloth or paper wanted

(State K & E Co. Catalogue number if possible)

Size of sheet: (over all) F =inches; G =inches

Margins: $\left\{ \begin{array}{l} A_1 = \dots\dots\dots A_2 = \dots\dots\dots A_3 = \dots\dots\dots A_4 = \dots\dots\dots \\ \text{Note: Dimensions } A_1 \text{ to } A_4 \text{ should not be less than } \frac{3}{8}'' \text{ for smaller} \\ \text{sheets and } \frac{1}{2}'' \text{ for larger sheets.} \\ B_1 = \dots\dots\dots B_2 = \dots\dots\dots B_3 = \dots\dots\dots B_4 = \dots\dots\dots \end{array} \right.$

Dimensions inside of Border line: D =inches; E =inches

Thickness of Border or Trimming line: L = No.; M = No.
(See other side of this sheet)

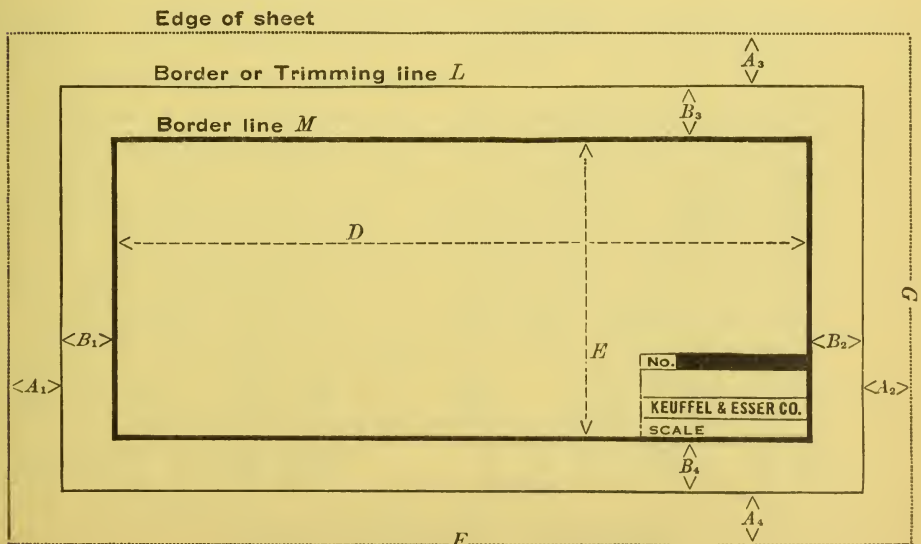
Title: Indicate on form below where imprint of Title should be placed.
Also state dimensions and number of type desired. If type to be used is different from that shown on other side of this sheet—submit copy with complete specifications.

Borderline and Title: to be printed onside of cloth, withtype.
Dull or Glazed Regular or Reversed

Sheets are imprinted with reverse type when the imprint is to be placed on the reverse side from that which is to be used as the drawing surface.

If sheets are to be punched, indicate on form below the location of holes and submit sketch showing exact spacing and size of holes.

Caution: Owing to shrinkage, blueprints are often not exact copies of tracings, hence it is advisable to give exact dimensions as required.



Standard Sizes of BORDER or TRIMMING LINES

No. 1.	
No. 2.	
No. 3.	
No. 4.	
No. 5.	
No. 6.	

Standard Sizes: SPACING of LINES

8 Point

9 Point

12 Point

14 Point

15 Point

18 Point

Standard Sizes of TYPES

No. 1	KEUFFEL & ESSER CO.	HOBOKEN, N. J.	No. 11	KEUFFEL & ESSER CO.	HOBOKEN
No. 2	KEUFFEL & ESSER CO.	HOBOKEN	No. 12	KEUFFEL & ESSER CO.	HOBOK
No. 3	KEUFFEL & ESSER CO.	HOB	No. 13	KEUFFEL & ESSER CO.	HO
No. 4	KEUFFEL & ESSER CO.	HO	No. 14	KEUFFEL & ESSER CO	
No. 5	KEUFFEL & ESSER CO.		No. 15	KEUFFEL & ESSER	
No. 6	KEUFFEL & ESSER		No. 16	KEUFFEL & ESS	
No. 7	KEUFFEL & ESS		No. 17	KEUFFEL & E	
No. 8	KEUFFEL & E		No. 18	KEUFFEL &	
No. 9	KEUFFEL &		No. 19	KEUFFEL	
No. 10	KEUFFEL		No. 20	KEUFFE	
			No. 21	KEUFF	

KEUFFEL & ESSER CO.

HOBOKEN, N. J.



K & E
REG. U. S. PAT. OFF.

TRACING PAPERS.

In Engineering Offices drawings are frequently traced, requiring a paper through which the lines of the underlying drawing are clearly visible. This paper is correctly termed "Tracing Paper." In architectural work, little tracing is done, since the original drawings and sketches are made directly on paper sufficiently transparent to produce blueprints. This paper, however, is also known as "Tracing Paper." Consequently, while the term "Tracing Paper" is used for all transparent drawing papers, many of these papers are not used for tracing.

In the first case, where the paper is really used for tracing, the visibility of the lines of the original drawing through the tracing paper is of great importance. The special characteristics of a paper conforming to this requirement we shall call "**Tracing Transparency**". In the second case, since the transparency of the paper is required only for making blueprints, we shall call it "**Blueprinting Transparency**", which represents the amount of actinic light rays passing through the paper. While it generally goes hand in hand with Tracing Transparency, yet in some papers a considerable difference does exist between the Tracing Transparency and the Blueprinting Transparency. This is especially true with some prepared (oiled) papers, in which the Tracing Transparency is greater than the Blueprinting Transparency. In other words, some prepared tracing papers may appear very transparent in tracing lines, but will not produce as good blueprints as their apparent transparency would seem to indicate. Natural tracing papers also vary considerably in this respect, due to the difference in surface and material.

In order to facilitate selection we have endeavored, as far as it is feasible, to classify "Tracing Transparency" and "Blueprinting Transparency" in the description of our tracing papers. For determining Tracing Transparency the K & E Color Analyser is employed, a highly scientific instrument for measuring light and color rays. The classification of Blueprinting Transparency is based on comparative blueprints made with the same exposure, the paper producing the darkest print being classified as the most transparent. Hence the classification is only relative, since good blueprints can be obtained from papers with only "fair" blueprinting transparency, provided that they are exposed for a sufficient length of time.

In tracing papers we must differentiate between natural tracing papers, and prepared tracing papers.

NATURAL TRACING PAPERS.

Much that has been stated about the qualities of good drawing paper also relates to good natural tracing papers. In order to obtain the necessary strength in a relatively thin paper and the highest transparency compatible with its weight, even greater care must be exercised in the selection of the raw material, which, for the best papers, must be of 100% clear, white rag stock. Natural tracing papers made of inferior material soon discolor and become brittle.

PREPARED TRACING PAPERS.

Most prepared tracing papers are those in which the transparency of the paper has been increased by the use of oil or similar material. Those that are made of improperly selected material are naturally subject to quick discoloration and to brittleness.

Vegetable Oil Papers. K & E Vegetable Oil Papers are prepared with a positive drying vegetable oil solution. Since the vegetable oil employed is a drying oil, it will not exude on to, nor soil, other papers with which these prepared papers come into contact. These papers, especially the *lonic*, take pencil and ink excellently. Pencil lines can be erased without smudging.

Mineral Oil Papers. Mineral Oil is a non-drying oil. Consequently, papers prepared with mineral oil will remain pliable and will retain their strength indefinitely. They will not discolor with age.

We shall be glad to furnish, free of charge, upon application, our 16 page booklet, entitled —

“Quality and Testing of Drawing, Tracing and Blueprint Papers.”

KEUFFEL & ESSER CO., NEW YORK

NATURAL TRACING PAPERS.

All Tracing Papers listed under this heading are "Natural" Tracing Papers. None of them contain any oil, wax, or similar substance, and consequently are not subject to the changes in color and strength which are bound to occur in nearly all prepared (oiled) papers.

Alba PAPERS

REG. U. S. PAT. OFF.

ROLLS WATERMARKED *Alba* REG. U. S. PAT. OFF.



Clear white tracing papers. Surface has a very fine tooth, most excellent for pencil drawings. Made of 100% highest grade rag stock of most unusual strength and cleanness. Thickness: No. 172—17*, No. 172H—19*. Tracing Transparency: No. 172 good, No. 172H good; Blueprinting Transparency†: No. 172 excellent; No. 172H good. In spite of their light weight Alba papers will withstand an unlimited amount of folding, and will not deteriorate with age.

Alba offers an unequalled combination of the three principal tracing paper qualities especially appreciated by architects, viz. excellent pencil surface, very high and uniform Blueprinting Transparency, and great strength and folding endurance.

Alba
Thin

ROLLS width in inches		36	42	57
172.	20 yards in tubes per roll			
172X.	50 " " " " " " " "			

Alba
Medium

ROLLS width in inches		36	42	57
172H.	20 yards in tubes per roll			
172HX.	50 " " " " " " " "			

Bianca PAPER
TRADE MARK

White tracing paper of stock containing a high percentage of clean rags. Surface has a very fine tooth, most excellent for pencil drawings. Thickness 19*. Tracing Transparency: good; Blueprinting Transparency†: very good.

Bianca is a very good tracing paper, particularly for architects, but does not possess the unequalled strength and folding quality of Alba paper No. 172.

Bianca

ROLLS width in inches		36	42	57
173.	20 yards per roll			
173X.	50 " " " " " " " "			

*The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thicknesses of the paper.

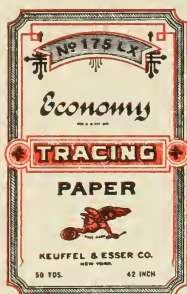
†The classification of blueprinting transparency is only relative. Good blueprints can be obtained by sufficient exposure from papers with only "fair" blueprinting transparency.



NATURAL TRACING PAPERS.

Economy PAPERS
REG. U. S. PAT. OFF.

ROLLS WATERMARKED *Economy* REG. U. S. PAT. OFF.



Strong natural white tracing papers with finely grained surface, containing a large percentage of clean rags. The erasing quality is good; and the paper takes pencil, ink and colors well. Thickness: No. 175L—22*, No. 175—25*. Tracing Transparency: No. 175L very good; No. 175 good. Blueprinting Transparency†: No. 175 L very good, No. 175 good.

Owing to their many useful qualities and moderate price, Economy Papers are great favorites with architects and engineers for all around detail and sketching papers.

Economy

Thin
SHEETS

175L- 1.	8½ × 11 in., (100 in envelope)	per hundred sheets
- 3.	12 × 18 in., (" " ")	
- 6.	18 × 24 in., (50 in tube)	
-10.	24 × 36 in., (" " ")	

ROLLS width in inches 36 42 60

175L. 20 yards . . . per roll

175LX. 50 yards . . . " "

Economy

Medium

ROLLS width in inches 36 42 60

175. 20 yards . . . per roll

175X. 50 yards . . . " "

Ecce PAPER

REG. U. S. PAT. OFF.

Very strong natural white tracing paper with finely grained surface, of clean part rag stock of high quality. The erasing quality is good; and the paper takes pencil, ink and water colors well. Thickness: 26*. Tracing Transparency: fair. Blueprinting Transparency†: fair.

This paper is recommended for rough sketches and for tracing from blueprints and heavy pencil drawings.

Ecce

Thin

ROLLS width in inches 36 42 60

176LX. 50 yards . . . per roll

*The figures indicating thickness in 1000ths of an inch are not absolute, but merely show the approximate thicknesses of the paper.

†The classification of blueprinting transparency is only relative. Good blueprints can be obtained by sufficient exposure from papers with only "fair" blueprinting transparency.

KEUFFEL & ESSER CO., NEW YORK

NATURAL TRACING PAPERS.

Torrine PAPERS

TRADE MARK

Strong natural tracing paper with finely toothed surface, which takes pencil and ink equally well. Its high transparency makes it ideal for the very exacting tracing of old and faded drawings. It has excellent erasing quality, since ink lines can be drawn over repeated erasures. Gives very clear blueprints and direct black line prints. No. 177H, in addition to the essentials of a fine tracing paper, has the weight of a drawing paper. Tracing and Blueprinting Transparency: No. 177, excellent; No. 177H, very good. Thickness: No. 177—25; No. 177H—35.*

Torrine

Medium
SHEETS

per 100 sheets

- 177-1. $8\frac{1}{2} \times 11$ in. (100 in envelope)
 - 3. 12×18 " (" " ")
 - 6. 18×24 " (50 in tube)
 -10. 24×36 " (" " ")

ROLLS width in inches

36 42

177. 20 yards per roll
 177X. 50 yards " "

Torrine

Heavy
SHEETS

per 100 sheets

- 177H-1. $8\frac{1}{2} \times 11$ in. (100 in envelope)
 - 3. 12×18 " (" " ")
 - 6. 18×24 " (100 in package flat)
 -10. 24×36 " (" " " ")

ROLLS width in inches

36 42

- 177H. 20 yards per roll
 177HX. 50 yards " "

Lucine PAPERS

REG. U. S. PAT. OFF.

Natural white tracing papers, very clear and transparent. Good pencil surface; take ink well; erasing quality is excellent; ink lines can be drawn over repeated erasures. Give very clear blue prints and direct black line prints. Thickness: 178T-19;* 178L-21;* 178-23.* Tracing and Blueprinting Transparency: 178T—very best; 178L and 178 excellent. Highly recommended for temporary drawings not subject to rough handling.

Lucine

Thin
SHEETS

per 100 sheets

- 178T-1. $8\frac{1}{2} \times 11$ in., (100 in envelope)
 -3. 12×18 " (" " ")
 -6. 18×24 " (50 in tube)

ROLLS width in inches

36 42

- 178T. 20 yards per roll
 178TX. 50 yards " "

*The figures indicating thickness in 10000th of an inch are not absolute, but merely show the approximate thickness of the paper.

†The classification of blueprinting transparency is only relative. Good blueprints can be obtained by sufficient exposure from papers with only "fair" blueprinting transparency.



NATURAL TRACING PAPERS.

Lucine PAPERS
REG. U. S. PAT. OFF.

(CONTINUED)

Lucine
Light
SHEETS

per 100 sheets

- 178L-1. $8\frac{1}{2} \times 11$ in., (100 in envelope)
-3. 12×18 " (" " ")
-6. 18×24 " (50 in tube)
-10. 24×36 " (" " ")

LAYOUT PADS

Pad of 100 sheets

- 178L-21. $8\frac{1}{2} \times 11$ in.
-23. 12×18 "
-26. 18×24 "
-29. 21×26 "

ROLLS width in inches

36

42

178L. 20 yards per roll

178LX. 50 yards " "

Lucine
Medium

SKETCHING PADS

- 178-11. $8\frac{1}{2} \times 11$ in., Pad of 50 sheets, with two sheets of cross section paper
 $8\frac{1}{2} \times 11$; one divided to 2mm; the other 10×10 to 1 in.;
color of lines black. per pad

No. 178-11 is old No. 353A.

ROLLS width in inches

36

42

178. 20 yards per roll

178X. 50 yards " "

Popular PAPER
TRADE MARK

Natural white tracing paper. Surface has a very fine tooth which takes pencil very well. Thickness 19". Tracing and Blueprinting Transparency: excellent. This paper is not made for strength and is intended for detail pencil drawings for temporary use only.

Popular

LAYOUT PADS

Pad of 100 sheets

- 179T-21. $8\frac{1}{2} \times 11$ in.
-23. 12×18 "
-26. 18×24 "
-29. 21×26 "

ROLLS width in inches

36

42

57

179T. 20 yards per roll

179TX. 50 yards " "

179T is old No. 179.



NATURAL TRACING PAPERS.

K & E BOND PAPER

REG. U. S. PAT. OFF.



Very strong clear white tracing papers with fairly smooth surface, of 100% highest grade rag stock of most unusual strength and cleanness. The erasing quality is perfect. These papers possess unusually high folding and tearing qualities, and will withstand almost any amount of rough handling. K & E Bond Papers are recommended very highly for tracings kept as permanent records subject to rough handling. They will not deteriorate with age and last indefinitely. Thickness: 180H-28*; 180-23*; 180L-20*. Blueprinting Transparency; 180H, medium; 180, fair; 180L, very good. Tracing Transparency†: 180H, medium; 180, fair, 180L, good.

K & E BOND

Light
SHEETS

		per ream	per quire
180L.	Double Royal 24×36 in.		
	ROLLS width in inches	36	42
180L.	20 yards per roll		
180LX.	50 yards “ “		

K & E BOND

Medium
SHEETS

		per ream	per quire
180.	Double Royal 24×36 in.		
	ROLLS width in inches	36	42
180.	20 yards per roll		
180X.	50 yards “ “		

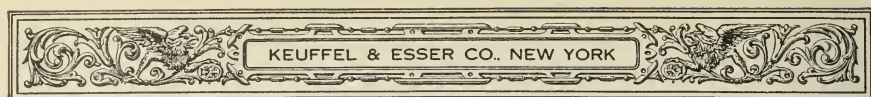
K & E BOND

Heavy
SHEETS

		per ream	per quire
180H.	Double Royal 24×36 in.		
	Double Elephant 27×40 “		
	ROLLS width in inches	36	42
180H.	20 yards per roll		
180HX.	50 yards “ “		

*The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thicknesses of the paper.

†The classification of blueprinting transparency is only relative. Good blueprints can be obtained by sufficient exposure from papers with only “fair” blueprinting transparency.



NATURAL TRACING PAPERS.

BANKNOTE PAPER

TRADE MARK

Very strong, clear white tracing papers of 100% clean high-grade rag stock. Erasing quality is good. N182 and N182S are of medium weight, N182L and N182LS are lighter, and N182T is thinner, but the lighter weights are also very strong and resistant to rough handling. Thickness: N182 and N182S-25;* N182L and N182LS-20;* N182T-17.* Blueprinting Transparency: N182 and N182S fair; N182L and N182LS, good; N182T very good. Tracing Transparency: N182 and N182S medium; N182L and N182LS fair; N182T good.

BANKNOTE

Thin. Pencil surface.

ROLLS	width in inches	30	36	42	54
N182T.	20 yards	per roll			
N182TX.	50 yards	" "			

BANKNOTE

Light. Pencil surface.

SHEETS		per ream	per quire	
N182L.	Double Royal 24×36 in.			
ROLLS width in inches		30	36	42
N182L.	20 yards " "			
N182LX.	50 yards " "			

BANKNOTE

Light. Smooth surface.

ROLLS	width in inches	42
N182LS.	20 yards	per roll
N182LSX.	50 yards	" "

BANKNOTE

Medium. Pencil surface.

SHEETS		per ream	per quire		
N182.	Double Royal 24×36 in.				
ROLLS width in inches		30	36	42	54
N182.	20 yards per roll				
N182X.	50 yards " "				

BANKNOTE

Medium. Smooth surface.

ROLLS	width in inches	42
N182S.	20 yards	per roll
N182SX.	50 yards	" "

Ferrine PAPER

TRADE MARK

White tracing paper with smooth surface, of stock containing a high percentage of high grade rags. The erasing quality is very good. The paper takes pencil and ink equally well. Thickness 22". Tracing and Blueprinting Transparency: sufficient for heavy lines.

This paper is recommended for all around use in engineering offices.

Ferrine

ROLLS	width in inches	30	36	42
185.	20 yards	per roll		
185X.	50 yards	" "		

*The figures indicating thickness in 1000ths of an inch are not absolute, but merely show the approximate thicknesses of the paper.

†The classification of blueprinting transparency is only relative. Good blueprints can be obtained by sufficient exposure from papers with only "fair" blueprinting transparency.

KEUFFEL & ESSER CO., NEW YORK

NATURAL TRACING PAPERS.

Lotus PAPERS
REG. U. S. PAT. OFF.

ROLLS WATERMARKED *Lotus* REG. U. S. PAT. OFF.



White tracing paper with very smooth surface, of part rag stock of high quality. The paper takes pencil and ink well. Thickness: No. 187L-14", No. 187-16". Tracing Transparency: No. 187L very best, No. 187 excellent. Blueprinting Transparency†: No. 187L excellent, No. 187 very good.

Owing to its very high transparency, Lotus paper is especially recommended for tracing.

Lotus
Thin
SHEETS
per ream per quire
187L. Double Elephant . . . 27 × 40 in.

Lotus
Thin
ROLLS width in inches 42
187L. 20 yards (in tubes) . . . per roll
187LX. 50 yards . . . " "

Lotus
Medium
SHEETS
per ream per quire
187. Royal 19 × 24 in.
Double Elephant . . . 27 × 40 "

Lotus
Medium
ROLLS width in inches 42
187. 20 yards (in tubes) . . . per roll
187X. 50 yards . . . " "

*The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thicknesses of the papers.

*The classification of blueprinting transparency is only relative. Good blueprints can be obtained by sufficient exposure from papers with only "fair" blueprinting transparency.



PREPARED VEGETABLE OIL TRACING PAPERS.

Abacus PAPER

REG. U. S. PAT. OFF.

Light blue prepared tracing paper with a very smooth surface. Thickness 13.*
Tracing and Blueprinting Transparency†: very best.

This is an exceptionally transparent paper, especially suitable for tracing the finest line drawings.

Abacus

ROLLS width in inches 42

192. 10 yards per roll

Doric PAPER

REG. U. S. PAT. OFF.

Pearl white, prepared tracing paper with a very smooth surface. Thickness 16*.
Tracing and Blueprinting Transparency†: very best.

Doric is a thin tracing paper in quality like Abacus but of slightly heavier weight.

Doric

ROLLS width in inches 42

193. 20 yards per roll



Ionic PAPERS

REG. U. S. PAT. OFF.

Cream white prepared tracing papers with fairly smooth surface of 100% clean rag stock. 196 and 197A strong, 197M and 197H very strong. Good erasing quality. Thickness: 196-23*; 197A-28*; 197M-30*; 197H-33*. Blueprinting Transparency†: 196, 197A, 197M and 197H very good. Tracing Transparency: 196 and 197A excellent; 197M and 197H very good.

Ionic

Thin

SHEETS

per hundred

196. Royal 19 × 24 in. . .
Imperial 22 × 30 " . .
Double Royal . 24 × 36 " . .
Double Eleph. . 30 × 42 " . .

ROLLS width in inches

30 36 42

196. 20 yds. (in tubes) per roll

196X. 50 yds. " "

*The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thicknesses of the papers.

†The classification of blueprinting transparency is only relative. Good blueprints can be obtained by sufficient exposure from papers with only "fair" blueprinting transparency.



PREPARED VEGETABLE OIL TRACING PAPERS.

Ionic PAPER
REG. U. S. PAT. OFF.

(CONTINUED)

Ionic
Light

SKETCHING PADS

197A-11. $8\frac{1}{2} \times 11$ in, pads of 50 sheets, with two sheets of cross section paper
 $8\frac{1}{2} \times 11$ in.; one divided to 2mm; the other 10×10 to 1 inch. Color
of lines: black. per pad

Light

SHEETS

per hundred

197A. Royal 19×24 in.
Imperial. 22×30 "
Double Royal 24×36 "
Double Elephant 30×42 "

ROLLS width in inches

30

36

42

197A. 20 yds. (in tubes) per roll

197AX. 50 yds. " "

Ionic
Medium

SHEETS

per hundred

197M. Royal 19×24 in.
Imperial. 22×30 "
Double Royal 24×36 "
Double Elephant 30×42 "

ROLLS width in inches

30

36

42

197M. 20 yds. (in tubes) per roll

197MX. 50 yds. " "

Ionic
Heavy

ROLLS width in inches

30

36

42

197H. 20 yds. (in tubes) per roll

197HX. 50 yds. " "



PREPARED MINERAL OIL TRACING PAPERS.



Crystalline PAPERS TRADE MARK

Very strong white mineral oil paper of 100% very clean rag stock. Good pencil surface. Excellent erasing quality. Thickness; 198L-25,* 198-28.* Tracing and Blueprinting Transparency; 198 and 198L very good.

Crystalline

Light

ROLLS	width in inches	30	36	42
198L.	20 yds. (in tubes)	per roll		
198LX.	50 yds.	" "		

Crystalline

Medium

ROLLS	width in inches	30	36	42	54
198.	20 yds. (in tubes)	per roll			
198X.	50 yds.	" "			

Berculine TRADE MARK

Very tough white mineral oil paper containing a high percentage of high grade rags. Smooth surface. Takes pencil well. Erasing quality is very good. Thickness 27*. Tracing and Blueprinting Transparency†: very good.

Berculine

ROLLS	width in inches	30	36	42
199.	20 yds.	per roll		
199X.	50 yds.	" "		

*The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thickness of the paper.

†The classification of blueprinting transparency is only relative. Good blueprints can be obtained by sufficient exposure from papers with only "fair" blueprinting transparency.

KEUFFEL & ESSER CO., NEW YORK

PHOTO PRINTING.

Four different processes, in general use for copying drawings from Tracing Paper and Tracing Cloth by means of light, are covered by the items in this Catalogue, namely;

- Dupro Process:** producing positive prints on tracing cloth—that is, black lines on transparent tracing cloth—by means of a Maduro negative print made from the original tracing, or a photographic negative of the original drawing.
- Blue Print Process:** producing a print with white lines on blue background, or blue lines on a white background, if the print is made from a negative.
- Maduro Process:** producing a negative print with white lines on a brown-black background; or a positive print with brown lines on white background, if the print is made from a negative.
- Black Print Process:** producing positive prints from the original tracing; that is, black lines on a white background.

Dupro

REG. U. S. PAT. OFF.

REPRODUCTION TRACING CLOTH

Dupro Reproduction Tracing Cloth is fully described on page 42.


BLUE PRINT PAPERS AND CLOTHS.

K & E Blue Print Papers and Cloths have been developed over a period of more than 50 years to the high standard of quality which they have now attained. The raw papers are made to strict specifications; and each lot is tested in the K & E Co. humidity and temperature controlled paper testing laboratory. Comparative paper tests can be made only under standardized conditions of this kind. The solutions with which these papers and cloths are coated have been developed in the K & E Co. research laboratory; and the quality of the solution is controlled by the chemical laboratory. The coating is performed on special machines designed and made by K & E Co. In these elaborate machines the temperature of the drying boxes is controlled automatically; and use is made of many other devices, such as air conditioning, to insure a uniformly good product. The coated paper and cloth is re-rolled and carefully inspected. This policy of controlling quality of raw material, coating solution, and finished product, is responsible for the steadily increasing demand for K & E Blue Print Papers and Cloths.

PRINTING SPEED. Each paper is available in a number of printing speeds. The correct speed for use in any electric blueprint machine is determined by the type of the machine, the power of its lamps, and the speed at which the prints are to be made. If this information is given with the initial order, the correct speed will be selected, or samples will be submitted from which the customer can make his own selection. If the blueprint paper is to be printed by sunlight, in a sun frame, this fact should be indicated on the order, so that the correct speed can be supplied.

In general, it is advisable to use as slow a printing speed as is practicable, since the slower printing papers usually have a wide printing range. Blueprints made on them show a very deep blue.

Printing speeds are kept constant; so that once a certain speed has been determined upon, a customer can always feel assured of getting the same speed on a re-order.


 KEUFFEL & ESSER CO., NEW YORK

K & E Co. Branches at **Chicago, St. Louis, San Francisco and Montreal**, equipped with modern plants for coating Blueprint Papers, insure that the stock obtained from them is always fresh and that orders can be filled immediately.

We are prepared to furnish Blue Print Papers in **sheets**, if ordered in reasonably large quantities. Sizes are not listed, since sheets are cut to order only to meet individual requirements.

Maduro PAPERS AND CLOTHS.

REG. U. S. PAT. OFF.


Maduro prints (made from line tracings) are **negative**; that is, they show white lines on an opaque brown-black background. In order to obtain a **positive** print, that is, dark lines on a white background, the first print from the original tracing should be made on thin Maduro Paper or Cloth (229T, 229TN, P229TN or 229CL) which are sufficiently transparent to permit of making positive prints. When many reproductions of a tracing are desired, it is economical to first make a number of negatives on thin paper and then use these negative Maduro Prints to make positive prints. This saves the tracing and produces pleasing and legible blue or brown line prints. Usually the thick Maduro paper or medium or thick cloth are used for positive prints, since they yield beautiful prints with nearly black lines on a clear white background.

When corrections or alterations on tracings are necessary, a negative of the tracing may be made on thin Maduro Paper or Cloth, with the portion to be altered or corrected blanked out with regular "Retoucher's" opaque or black drawing ink;* and from this a positive print made on thin Maduro Paper. The correction can then be drawn in with ink and the amended positive print used in the same manner as a tracing. This saves the expense of altering the original tracing or of making a new one. Where desirable, additions may be drawn in on the face of any Maduro negative print with Maduro Writing Fluid No. 3025M.

Maduro solution has been developed to give clear whites on a perfectly opaque deep brown-black background. The **Speed** of this solution is about equivalent to that required to produce a good deep blue on a medium speed blue print paper; for which reason Maduro Prints can readily be made on modern continuous printing machines. Maduro Prints are developed in water and fixed in a bath containing fixing salt. A box of Fixing Salt, 229S, with directions for making Maduro prints, is furnished with each roll.

All brownprint papers must be stored in a cool place in order to prevent deterioration in strength.

*No-Rinkle-Blak No. 3021, is admirable for the purpose, since no puckers will form where it has been applied.


 KEUFFEL & ESSER CO. NEW YORK

DIRECT BLACK PROCESS PAPERS.

Direct Black Process Papers give an exact facsimile of the original drawing in clear black lines on a white background direct from original tracings without the use of negatives. Printing is done on blueprinting machines of any type; and the developing is done by hand applications, or in a power driven machine.

WHAT TO SPECIFY WHEN ORDERING.

When ordering, it is necessary to specify **length** of roll, **width** and **speed** in addition to the **catalog number**. The various papers are described in order to make easier the selection of the paper which has the qualities best suited to the requirements of the consumer.

SHIPPING.

All **K & E** Photo Print papers and cloths are well wrapped; and if the wrapper is not opened they will keep for a long time. All print papers and print cloth should be stored in a **dry** place; and in addition to this brown and black print papers, brown print cloth, and Dupro reproduction cloth, should always be stored in a **cool** place.

For use in the Tropics each roll is double wrapped and, if so ordered, they are furnished packed either in zinc lined cases, or each roll in a tin tube, hermetically sealed. Prices on request.

PHOTO PRINTING FOR THE TRADE.

K & E establishments in **New York, Chicago, St. Louis, San Francisco** and **Montreal** are fully equipped with the most modern photo printing machinery in charge of expert printers.

Orders for printing, large or small, in any of the above processes, including Dupro, will receive careful attention.



K & E

REG. U. S. PAT. OFF.

REPRODUCTION TRACING CLOTH.

Dupro

REG. U. S. PAT. OFF.



Dupro Reproduction Tracing Cloth is a waterproof tracing cloth covered with a special light sensitive emulsion. Finished Dupro Reproductions are exact black line copies of the original drawing or tracing; consequently, they can be employed for exactly the same purposes as an original tracing.

Dupro Reproductions are generally made on Dupro Reproduction Tracing Cloth by exposing it in standard blue print equipment under a Maduro negative (see page 40) made from the pencil or ink tracing which is to be reproduced. After exposure, only water and developer baths are required; so that little equipment, in addition to that found in the average blueprint room, is needed.

Perfect Dupro Reproductions can be made from old original tracings, containing cracks or spots, by blocking out these defects on the Maduro negative. Opaque drawings or blueprints can be produced as Dupro Reproductions by making photographic, instead of Maduro, negatives from the original

Dupro REPRODUCTION TRACING CLOTH

ROLLS	width in inches	30	36	42
-------	-----------------	----	----	----

207. 10 yards . . . per roll

207D. 20 " . . . " "

No. 207 is old No. 242

Dupro DEVELOPER

207-10. Dupro Developer, sufficient to make 3 gallons of solution, to develop approximately 50 yards . . . per box

No. 207-10 is old No. 242-10.

Directions for the use of Dupro Reproduction Tracing Cloth and Developer are furnished with every roll.

K & E BRANCH HOUSES ARE EQUIPPED TO MAKE DUPRO REPRODUCTIONS

Vacuum Print Frames, No. 2470, and their accessories, for use in making Dupro Reproductions, are described in this Catalogue.



K & E
REG. U. S. PAT. OFF.

BLUEPRINT PAPERS.

Helios BLUEPRINT PAPER
REG. U. S. PAT. OFF.

EACH ROLL WATERMARKED "K & E Co. *Helios* REG. U. S. PAT. OFF."



Helios Blueprint Paper, made of 100% rag stock, is exceptionally clean, and hard sized. In its character it is much like a drawing paper, since it is very uniform in quality and takes pencil, ink, and water colors well. These points are of value when alterations or additions are to be made on line prints. Thickness 50*.

Helios Blueprint Paper is the first blueprint paper introduced by K & E Co. and is still acknowledged to be the best and most reliable. For fine blueprints and blue line prints it has no equal. It is recommended for very fine map prints, for prints from photographic plates, for record prints, or for any print where a high grade paper, a clean pure white, and a dark uniform blue are appreciated.

Helios

Weight No. 24.

ROLLS width in inches 36

220. 10 yards . . . per roll
10 yard rolls are furnished in cardboard tubes.

220X. 50 " . . . " "

PARCHMINE BLUEPRINT PAPERS

TRADE MARK

EACH ROLL WATERMARKED "PARCHMINE, 100% RAG".



Parchmine Blue Print Papers, made of 100% rag stock of unusually high strength, are very clean and hard sized. This paper is made especially for strength and toughness. Thickness No. 223ET-32*, 223M-45*, 223H-55*.

Parchmine Papers will produce very fine blueprints or blue line prints on a clean white background. Owing to their unusual strength and toughness they are recommended for all prints intended to be filed or folded for records, or which must withstand an unusual amount of rough handling.

PARCHMINE

Weight No. 16.

ROLLS width in inches 24 30 36 42 54

223ET. 10 yards . . . per roll

223ETX. 50 " . . . " "

*The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thicknesses of the papers.



BLUEPRINT PAPERS.

PARCHMINE BLUEPRINT PAPERS

TRADE MARK

(CONTINUED)



EACH ROLL WATERMARKED "PARCHMINE 100%".

PARCHMINE

Weight No. 24.

ROLLS	width in inches	24	30	36	42	54
-------	-----------------	----	----	----	----	----

223M. 10 yards . . . per roll

223MX. 50 " . . . " "

PARCHMINE

Weight No. 30.

ROLLS	width in inches	30	36	42	54
-------	-----------------	----	----	----	----

223H. 10 yards . . . per roll

223HX. 50 " . . . " "

Columbia BLUEPRINT PAPER

REG. U. S. PAT. OFF.

EACH ROLL WATERMARKED "K & E Co. *Columbia* REG. U. S. PAT. OFF."



Columbia Blue Print Paper is very strong, and is made of 100% rag stock, and hard sized. Thickness 52*.

Columbia Blue Print Paper is intended for high grade blueprints for general use. It produces very good blue line prints on a clean white background and very fine blueprints.

Columbia

Weight No. 24.

ROLLS	width in inches	30	36	42
-------	-----------------	----	----	----

224. 10 yards . . . per roll

224X. 50 " . . . " "

*The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thicknesses of the papers.

KEUFFEL & ESSER CO., NEW YORK

BLUEPRINT PAPERS

CHALLENGE BLUEPRINT PAPERS

TRADE MARK

EACH ROLL WATERMARKED "CHALLENGE 50%".

Challenge Blueprint Papers are made of 50% rag stock; and produce very good blueprints.



CHALLENGE

Weight No. 17.

ROLLS width in inches 24 27 30 36 42

210TX. 50 yards . . per roll

CHALLENGE

Weight No. 20½.

ROLLS width in inches 24 27 30 36 42 48 54

210LX. 50 yards . . per roll

CHALLENGE

Weight No. 24.

ROLLS

width in inches

24 27 30 36 42 48 54

210MX. 50 yards . . . per roll

BLUEPRINT CLOTHS

COLUMBIA BLUEPRINT CLOTH

TRADE MARK

Columbia Blueprint Cloth, because of its strength, is preferred for prints intended for rough handling, especially in outdoor work.



COLUMBIA BLUEPRINT CLOTH

Thin

ROLLS width in inches

30 36 42

228L. 10 yards . . per roll

228LX. 50 " . . " "

COLUMBIA BLUEPRINT CLOTH

Columbia Cloth No. 228½ is intended for fine map prints. This cloth is very finely woven and will shrink or distort very little. It is recommended for all purposes where high printing qualities, minimum shrinkage and distortion, and the strength of a fairly thin cloth are desired.

Medium

ROLLS

width in inches

30 36 42

228½. 10 yards . . . per roll

228½X. 50 " . . . " "

COLUMBIA BLUEPRINT CLOTH

Thick

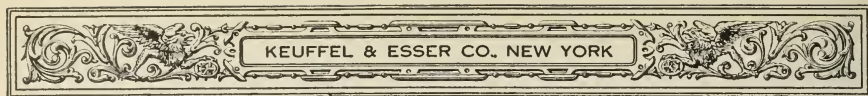
ROLLS

width in inches

30 36 42 54

228. 10 yards . . . per roll

228X. 50 " . . . " "



K & E
REG. U. S. PAT. OFF.

BROWN PRINT PAPERS.

Maduro BROWN PRINT PAPER
REG. U. S. PAT. OFF.

(See page 40).



Maduro Paper is made of 100% rag stock of exceptional strength and cleanness, and hard sized. Thickness No. 229TN-24*; No. 229T- 29*; No. 229M- 42*.

Maduro Papers represent the best that can be obtained in brown print papers with respect to raw stock as well as solution. The raw stock possesses the highest tearing and folding qualities, and will withstand rough handling. This high strength is of greatest value, especially in the thin papers 229TN and 229T. No. 229TN is thin, very transparent, and consequently an excellent paper for both positives and negatives. For very large size prints however, No. 229T, also an excellent negative paper, is recommended, since it can be handled more readily owing to its somewhat heavier weight. Before printing, Maduro papers should be stored in a cool place in order to prevent deterioration in strength.

Maduro PAPER (For Positives and Negatives.)

Weight No. 14.

ROLLS	width in inches	30	36	42
-------	-----------------	----	----	----

229TN. 10 yards . . . per roll

229TNX. 50 " . . . " "

Maduro PAPER (Transparentized, for Negatives.)

Weight No. 14.

ROLLS	width in inches	30	36	42
-------	-----------------	----	----	----

P229TN. 10 yards . . . per roll

P229TNX. 50 " . . . " "

Maduro PAPER (For Positives and Negatives.)

Weight No. 16.

ROLLS	width in inches	30	36	42	54
-------	-----------------	----	----	----	----

229T. 10 yards . . . per roll

229TX. 50 " . . . " "

Maduro PAPER (For Positives)

Weight No. 24.

ROLLS	width in inches	30	36	42	54
-------	-----------------	----	----	----	----

229M. 10 yards . . . per roll

229MX. 50 " . . . " "

Maduro FIXING SALT

4	8	16 oz. box
---	---	------------

229S. per box

Note: A 2 oz. box of Maduro Fixing Salt is furnished with each roll of Maduro paper. Complete directions for use are furnished with every roll of Maduro paper.

*The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thickness of the paper.



K & E
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BROWN PRINT CLOTHS.

Maduro BROWN PRINT CLOTH
REG. U. S. PAT. OFF.

(See page 40)



Maduro Brownprint Cloth, because of its strength, is preferred for prints intended for rough handling, especially in outdoor work. Before printing, it should be stored in a **cool** place to prevent deterioration in strength.

Maduro CLOTH (For Positives and Negatives.)

Thin.

	ROLLS	width in inches	30	36	42
229CL.	10 yards	per roll			
229CLX	50 "	" "			

Maduro CLOTH (For Positives and Negatives.)

Maduro Cloth No. 229½CL is intended for fine map prints. This cloth is very finely woven and will shrink or distort very little. It is recommended for all purposes where high printing qualities, minimum shrinkage and distortion, and the strength of a fairly thin cloth are desired.

Medium

	ROLLS	width in inches	30	36	42
229½CL	10 yards	per roll			
229½CLX.	50 "	" "			

Maduro CLOTH (For Positives.)

Thick

	ROLLS	width in inches	30	36	42	54
229C.	10 yards	per roll				
229CX.	50 "	" "				

Maduro FIXING SALT

	4	8	16 oz. box
229S.	per box

Note: A 2 oz. box of Maduro Fixing Salt is furnished with each roll of Maduro Cloth. Complete directions for use are furnished with every roll of Maduro Cloth.



BLACK PRINT PAPER.

DIRECT BLACK PROCESS PAPER.

Direct Black Process Paper yields prints having black lines on a white background. These prints are produced as positives; and no negative is required.

DIRECT BLACK PROCESS PAPER.

Thin

ROLLS	width in inches	30	36	42	54
N233T.	10 yards per roll				
N233TX.	50 " " "				

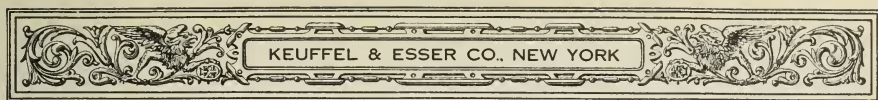
DIRECT BLACK PROCESS PAPER.

Medium

ROLLS	width in inches	30	36	42	54
N233M.	10 yards per roll				
N233MX.	50 " " "				

DIRECT BLACK PROCESS DEVELOPER.

N237-2. Sufficient to make $\frac{1}{2}$ gallon of solution per can



K & E
REG. U. S. PAT. OFF.

PROFILE AND CROSS SECTION PAPERS AND CLOTHS.



Reduced fac-similes of labels of "Standard" Profile Papers and Cloths

Special attention is called to the **high quality** of paper and cloth that is used for the profile and cross section papers and cloths in sheets and in continuous rolls described on pages 50 to 62 inclusive (Simplex, page 54, not included) as follows:

Drawing Paper: Very high quality, 100% rag stock of great strength and cleanness; hard sized; and of very good erasing quality. Thickness; Heavy 55*, Medium 36*.

Mounted Drawing Paper: Made in the same high quality as our regular mounted drawing papers, as described on page 19 of this Catalogue.

Tracing Paper: Very high quality, 100% clean high grade rag stock, of very high strength, which will withstand rough handling. Thickness 22*.

Tracing Cloth: All Profile and Cross Section Tracing Cloths are of the well known **Imperial** brand, which does not require any description.

Columbia Cloth: A heavy, opaque (not transparent), smooth surfaced cloth, suitable for both pencil and ink. It is especially recommended for outdoor and shop work, since it will withstand an unlimited amount of rough handling.

All Profile and Cross Section sheets and continuous rolls are **printed in our factory in Hoboken, N. J.**, on well seasoned stock. This reduces the expansion and shrinkage of the paper and cloth to a minimum; thus insuring the highest possible accuracy in the spacing of the lines.

*The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thicknesses of the papers.

KEUFFEL & ESSER CO., NEW YORK

STANDARD

REG. U. S. PAT. OFF.

PROFILE PAPERS AND CLOTHS.

IN CONTINUOUS ROLLS.

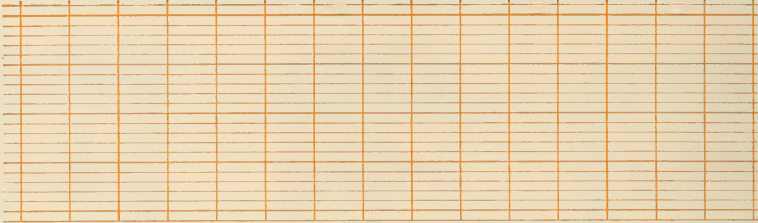


Plate A. 4 × 20 to the inch.

		Width of Roll	Width of Engraving	Color of Lines	Length of Roll
253 G.	Drawing Paper, heavy	22 in.	20 in.	green	50 yds.
253 R.	" " "	22 "	20 "	orange	"
254 G.	" " "	12 "	10 "	green	"
254 R.	" " "	12 "	10 "	orange	"
255 G.	Mounted on muslin,	22 "	20 "	green	20 yds.
255 R.	" " "	22 "	20 "	orange	"
257 R.	Tracing Paper,	22 "	20 "	"	50 yds.
257 ½ R.	" " "	12 "	10 "	"	"
258 R.	Imperial Tracing Cloth,	23 "	20 "	"	20 yds.
258 ½ R.	" " "	12 ½ "	10 "	"	"
259 G.	Columbia Cloth, Opaque	22 "	20 "	green	"

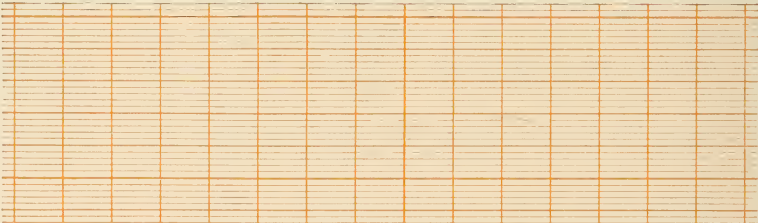
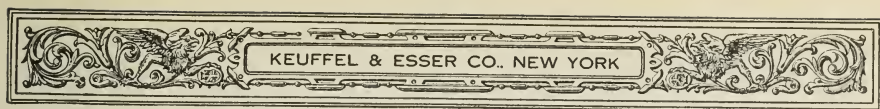


Plate B. 4 × 30 to the inch.

		Width of Roll	Width of Engraving	Color of Lines	Length of Roll
263 G.	Drawing Paper, heavy	22 in.	20 in.	green	50 yds.
263 R.	" " "	22 "	20 "	orange	"
264 G.	" " "	12 "	9 "	green	"
264 R.	" " "	12 "	9 "	orange	"
265 G.	Mounted on muslin,	22 "	20 "	green	20 yds.
265 R.	" " "	22 "	20 "	orange	"
267 R.	Tracing Paper,	22 "	20 "	"	50 yds.
267 ½ R.	" " "	12 "	9 "	"	"
268 R.	Imperial Tracing Cloth,	23 "	20 "	"	20 yds.
269 G.	Columbia Cloth, Opaque	22 "	20 "	green	"



STANDARD

REG. U. S. PAT. OFF.

PROFILE-PLAN PAPERS AND CLOTHS. IN CONTINUOUS ROLLS.



In **Profile-Plan Paper**, the profile ruling with its margin is only half the width of the paper, the other half being left blank for sketching difficult cuts or fills, embankments or excavations, etc. and for explanatory notes. This is a very convenient and accurate method, which saves referring to several maps for the same information. In mapping complicated cuts, fills, embankments, etc., it is indispensable.



Plate A. 4×20 to the inch.

		Width of Roll	Width of Engraving	Color of Lines	Length of Roll
253 H.G.	Drawing Paper, heavy	22 in.	10 in.	green	50 yds.
253 H.R.	" " "	22 "	10 "	orange	"
254 H.R.	" " "	12 "	5 "	"	"
257 H.R.	Tracing Paper,	22 "	10 "	"	"
257½ H.R.	" " "	12 "	5 "	"	"
258 H.R.	Imperial Tracing cloth,	23 "	10 "	"	20 yds.
258½ H.R.	" " "	12½ "	5 "	"	"



Plate B. 4×30 to the inch.

		Width of Roll	Width of Engraving	Color of Lines	Length of Roll
263 H.G.	Drawing Paper, heavy	22 in.	9 in.	green	50 yds.
263 H.R.	" " "	22 "	9 "	orange	"
267 H.R.	Tracing Paper,	22 "	9 "	"	"
268 H.R.	Imperial Tracing cloth,	23 "	9 "	"	20 yds.

All "STANDARD" Profile Papers and Cloths bear this trade mark along the margin.
For quality of papers and cloths shown on this page, see page 49.

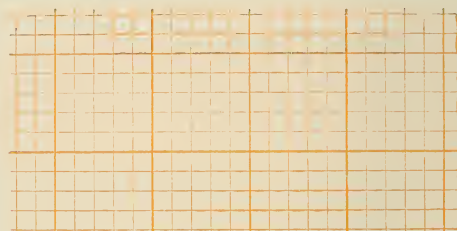
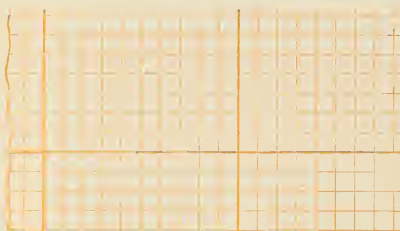


STANDARD

REG. U. S. PAT. OFF.

CROSS SECTION PAPERS AND CLOTHS.

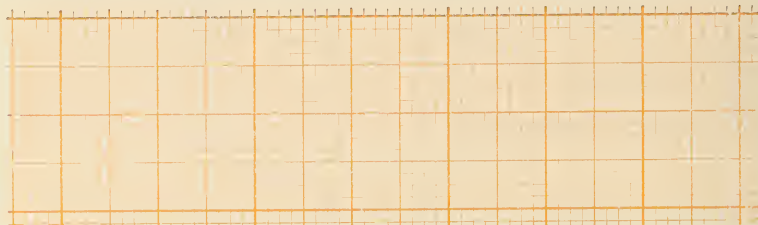
IN SHEETS AND IN CONTINUOUS ROLLS.



10 × 10 to the inch,
Nos. 280 and 283 to 289,

10 × 10 to the inch, 5th line heavy
Nos. 282G and 282½G

		Size of Sheet	Size of Engraving	Color of Lines	quire
280 G.	Drawing Paper, heavy	18 × 23 in.	16 × 20 in.	green	
280 R.	" " "	"	"	orange	
280 TR.	Tracing Paper,	"	"	"	
		Width of Roll	Width of Engraving	Color of Lines	Length of Roll
282 G.	Drawing Paper, heavy	26 in.	24 in.	green	50 yds.
282½ G.	Tracing Paper,	26 "	24 "	"	"
283 G.	Drawing Paper, heavy	22 "	20 "	"	"
283 R.	" " "	22 "	20 "	orange	"
284 G.	" " "	12 "	10 "	green	"
285 G.	Mounted on muslin,	22 "	20 "	"	20 yds.
285 R.	" " "	22 "	20 "	orange	"
287 R.	Tracing Paper,	22 "	20 "	"	50 yds.
288 G.	Imperial Tracing Cloth,	23 "	20 "	green	20 yds.
288 R.	Imperial Tracing Cloth,	23 "	20 "	orange	"
289 G.	Columbia Cloth, Opaque	22 "	20 "	green	"



16 × 16 to the inch, 8th lines heavy

		Size of Sheet	Size of Engraving	Color of Lines	quire
290 G.	Drawing Paper, heavy	18 × 23 in.	16 × 20 in.	green	
290 R.	" " "	"	"	orange	
290 TR.	Tracing Paper,	"	"	"	
		Width of Roll	Width of Engraving		50 yard roll
293 G.	Drawing Paper, heavy	22 in.	20 in.	green	
293 R.	" " "	22 "	20 "	orange	

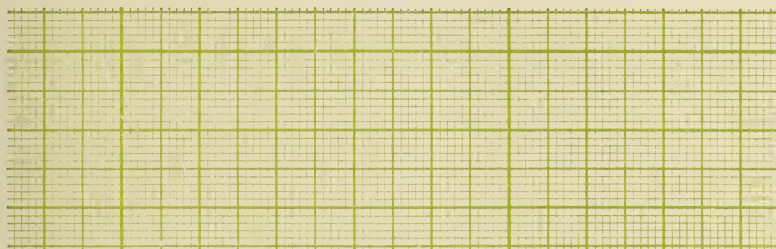
KEUFFEL & ESSER CO., NEW YORK

STANDARD

REG. U. S. PAT. OFF.

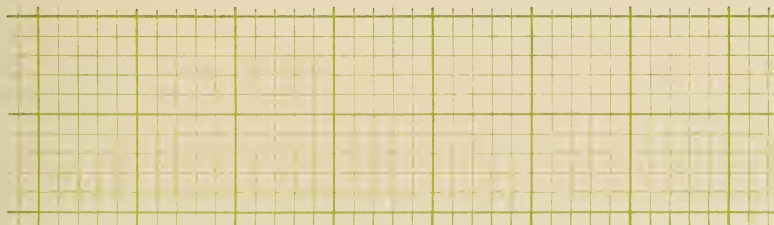
CROSS SECTION PAPERS AND CLOTHS.

IN SHEETS AND IN CONTINUOUS ROLLS.



Millimeters, $\frac{1}{2}$ cm. lines heavy.

		Size of Sheet	Size of Engraving.	Color of Lines	quire
300 G.	Drawing Paper, heavy	18×23 in.	40×50 cm.	green	
300 R.	“ “ “	“	“	orange	
300 TR.	Tracing Paper,	“	“	“	
		Width of Roll.	Width of Engraving	Color of Lines	Length of Roll
303 G.	Drawing Paper, heavy	22 in.	50 cm.	green	50 yds.
303 R.	“ “ “	22 “	50 “	orange	“
305 G.	Mounted on muslin,	22 “	50 “	green	20 yds.
305 R.	“ “ “	22 “	50 “	orange	“
306 G.	Drawing Paper, heavy	32 “	75 “	green	50 yds.
306 R.	“ “ “	32 “	75 “	orange	“
307 R.	Tracing Paper,	22 “	50 “	“	“
307 $\frac{1}{2}$ R.	“ “ “	32 “	75 “	“	“
308 G.	Mounted on muslin,	32 “	75 “	green	20 yds.
308 R.	“ “ “	32 “	75 “	orange	“
308 $\frac{1}{2}$ R.	Imperial Tracing Cloth,	23 “	50 “	“	“
309 R.	“ “ “	33 $\frac{1}{2}$ “	75 “	“	“



5 × 5 to the half-inch.

		Size of Sheet	Size of Engraving	Color of Lines	quire
320 G.	Drawing Paper, heavy	18 × 23 in.	16 × 20 in.	green	
320 R.	“ “ “	“	“	orange	
320 TR.	Tracing Paper,	“	“	“	
10 × 10 to the inch with every second line heavy.					
321 G.	K&E Bond Paper No.180	18 × 23 in.	16 × 20 in.	green	

All “STANDARD” Cross Section Papers and Cloths bear this trade mark along the margin.

For quality of papers and cloths shown on this page, see page 49.

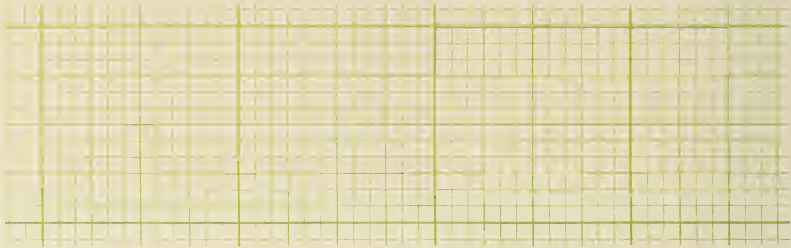


STANDARD

REG. U. S. PAT. OFF.

CROSS SECTION PAPERS.

IN SHEETS.



12 × 12 to the inch.

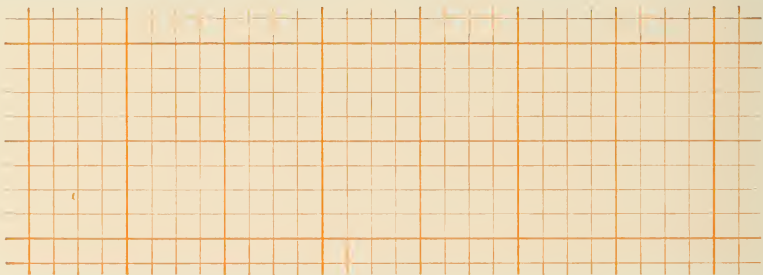
	Size of Sheet	Size of Engraving	Color of Lines	quire
322 G. Drawing Paper, heavy	18 × 23 in.	16 × 20 in.	green	

SIMPLEX CROSS SECTION PAPERS.

REG. U. S. PAT. OFF.

30 IN. ENGRAVING. IN CONTINUOUS ROLLS.

Simplex Cross Section Paper is intended for architectural and mechanical full-size detail sketches.



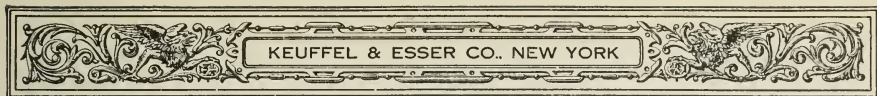
8 × 8 to the inch, every 4th line heavy.

	Width of Roll	Width of Engraving	Color of Lines	50 yard roll
326 R. Dark Buff Detail Paper,	32 in.	30 in.	orange	

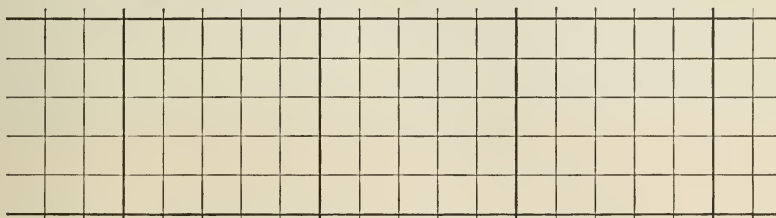
A strong paper, of stock free from ground wood.

326 D. White Detail Paper,	32 "	30 "	"	
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White drawing paper of fairly heavy weight.



RULED CROSS SECTION PAPERS.

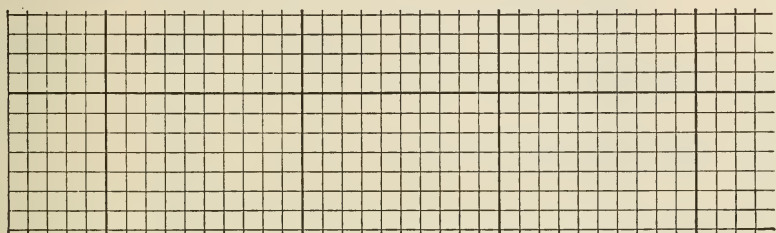


Sheets, 17 × 22 in., 5 × 5 to the inch, ruled blue

N330. Drawing Paper, heavy weight

Ten

N330L. Drawing Paper, medium weight

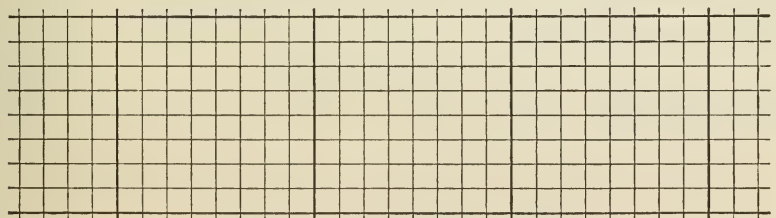


Sheets, 17 × 22 in., 10 × 10 to the inch, ruled blue

N331. Drawing Paper, heavy weight

Ten

N331L. Drawing Paper, medium weight



Sheets, 17 × 22 in., 8 × 8 to the inch, ruled blue

N332. Drawing Paper, heavy weight

Ten

N332L. Drawing Paper, medium weight



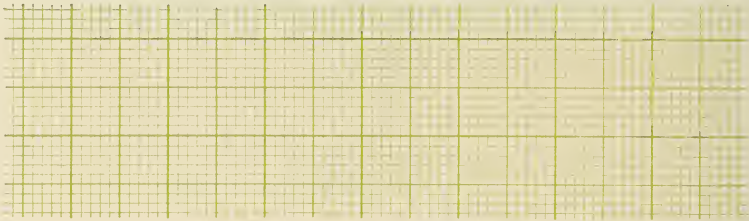
Topographical Paper, Sheets, 17 × 22 in., 400 feet to the inch, ruled red and blue.

N333. Drawing Paper, heavy weight

Ten



CONSTRUCTOR'S SKETCH PAPER AND CLOTH.

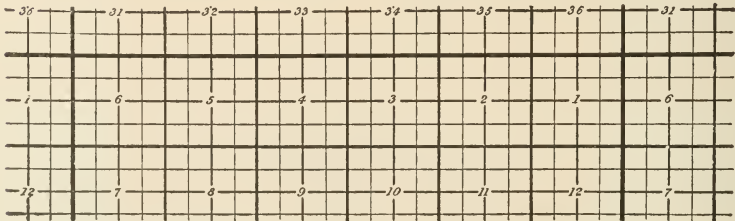


10 × 10 to the half inch, fifth lines heavy.

		Size of Sheet	Size of Engraving	Color of Lines	Ten	Hund.
334-1N.	Drawing Paper, medium	7×8½ in.	5×7½ in.	green		
334-1TN.	Tracing Paper,	"	"	"		
334-1TR.	"	"	"	orange		
334-1CR.	Imperial Tracing Cloth	"	"	"		
334-2N.	Drawing Paper, medium	8½×12¼ in.	7½×10 in.	green		
334-2B.	"	"	"	blue		
334-2K.	"	"	"	black		
334-2TN.	Tracing Paper,	"	"	green		
334-2TB.	"	"	"	blue		
334-2TR.	"	"	"	orange		
334-2CR.	Imperial Tracing Cloth	"	"	"		
334-3N.	Drawing Paper, medium	11½×17 in.	10×15 in.	green		
334-3TN.	Tracing Paper,	"	"	"		
334-3TR.	"	"	"	orange		
334-3CR.	Imperial Tracing Cloth	"	"	"		
		Width of Roll	Width of Engraving			50 yard roll
334½N.	Drawing Paper, heavy	22 in.	20 in.	green		
334½TN.	Tracing Paper,	"	"	"		

Constructor's Sketch Paper No. 334 in sheets, is carried in four colors. **Orange** and **green** are the colors most widely used, because the cross section lines show on a photograph or blueprint. If very distinct cross section lines are required on a photograph or blueprint, **black** gives the best results. **Blue**, especially if fully exposed, will not show the cross section lines.

TOWNSHIP PAPER.



		Size of Sheet	Size of Engraving	Color of Lines	Sheet	Ten
335.	Drawing Paper, heavy	18×23 in.	15×18 in.	black		

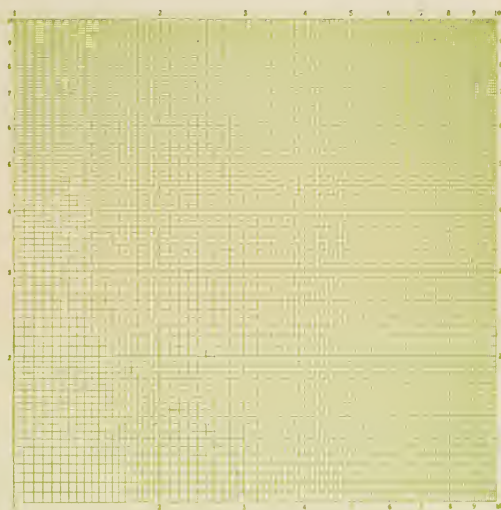
This paper is divided into 5 townships vertically and 6 horizontally, subdivided to sections and quarter-sections properly numbered.
(See also page 70)

KEUFFEL & ESSER CO., NEW YORK

LOGARITHMIC PAPERS.

Among the various relationships which may be represented by means of these papers, are: Circumferences and areas of circles in terms of their radii or diameters, or the inverse; moments of inertia and radii of gyration in terms of a linear dimension, or the inverse; length of pendulum and time of oscillation; powers and roots of any and all indices; weights of a series of bodies of the same substance and form but of varying size, or the inverse, in terms of a linear dimension; sizes of shafts, struts, tie bars, etc., in terms of varying load, or the inverse; shearing stress, bending moment or deflection of beams, or the inverse, in terms of load, etc., etc.

DURAND'S LOGARITHMIC PAPER.



	Size of Sheet	Size of Engraving	Color of Lines	
N336.	Drawing Paper, medium	$11\frac{1}{2} \times 11\frac{1}{2}$ in.	25×25 cm. ($9\frac{1}{8} \times 9\frac{1}{8}$ in.)	green sheet ten

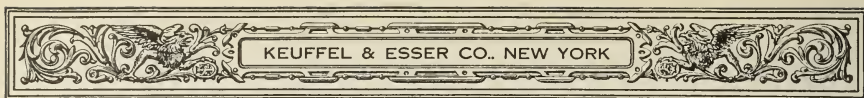
This paper has a single 25 cm. logarithmic scale in each direction.

JENSEN'S LOGARITHMIC PAPER.

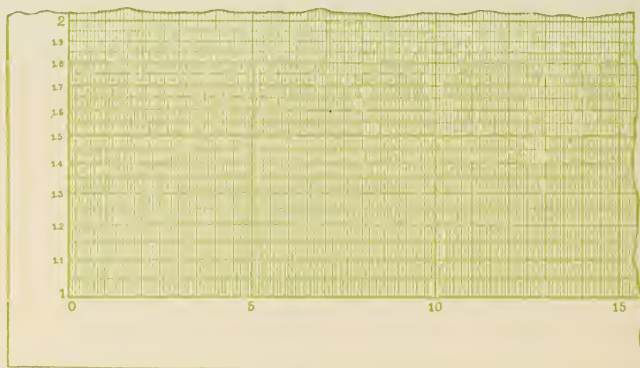


	Size of Sheet	Size of Engraving	Color of Lines	
336 J.	Tracing Paper,	$11\frac{1}{2} \times 17$ in.	10×10 in.	orange sheet ten

Jensen's Logarithmic Paper is similar to Durand's, but has two 5 in. logarithmic scales in each direction, instead of one.



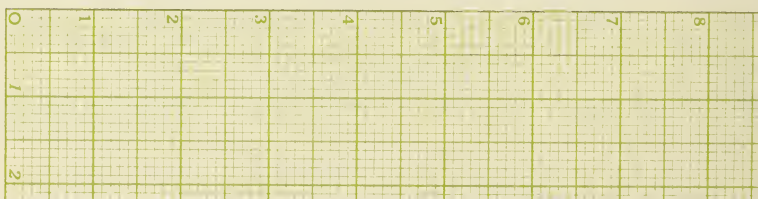
SEMI-LOGARITHMIC PAPER.



	Size of Sheet	Size of Engraving	Color of Lines	Sheet	Ten
336 P.	Drawing Paper, heavy	16×21 in.	25×50 cm.	green	

The ordinate measures 25 cm. and has a single logarithmic scale; the space from 1 to 2, having twenty sub-divisions and from 2 to 3, 3 to 4 etc., up to 10, having ten divisions. The abscissa is divided into equal parts of one millimeter.

WEBB'S CO-ORDINATE PAPER.



Webb's Co-ordinate paper is a convenient and accurate cross section paper for drafting rooms, technical schools, laboratories, etc. It is printed from accurate engravings in a neutral tint which can be photographed or photo-printed. The scale of the rulings is between the English and French ($\frac{1}{8}$ inches and centimeters) subdivided 10×10 . The lines of Nos. 337 to 337-1L are numbered in two directions for ready reference to any point on the paper and the sheets are punched for portfolio binding.

		Size of Sheet	Size of Engraving	No. of Divisions.	Color of Lines	Sheet
337.	Best Linen	$8\frac{7}{8} \times 11\frac{3}{8}$ in.	$8\frac{1}{8} \times 9\frac{7}{8}$ in.	180×220	neutral tint	
337L.	Record Paper	$11\frac{3}{8} \times 17\frac{3}{4}$ "	$10\frac{3}{4} \times 15\frac{3}{4}$ "	240×350	" "	
337-1.	Best Thin	$8\frac{7}{8} \times 11\frac{3}{8}$ "	$8\frac{1}{8} \times 9\frac{7}{8}$ "	180×220	" "	
337-1 L.		$11\frac{3}{8} \times 17\frac{3}{4}$ "	$10\frac{3}{4} \times 15\frac{3}{4}$ "	240×350	" "	
337-2.	Bond Paper	$8 \times 10\frac{3}{4}$ "	$7\frac{1}{8} \times 9\frac{7}{8}$ "	160×220	" "	
337-2 L.		$10\frac{1}{2} \times 16$ "	$9\frac{7}{8} \times 14\frac{3}{4}$ "	220×330	" "	
337-3.	Drawing Paper	$8 \times 10\frac{5}{8}$ "	$7\frac{1}{8} \times 9\frac{7}{8}$ "	160×220	" "	

per block of 50 sheets.



PROGRESS CROSS SECTION PAPER.

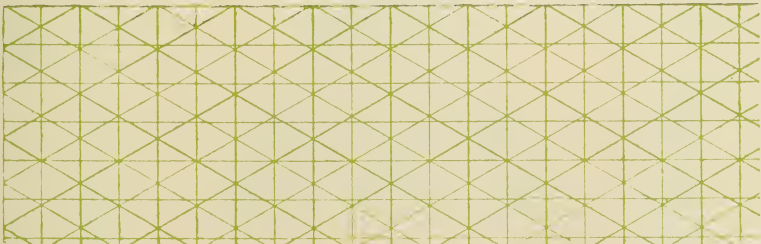
TRADE MARK



	Size of Sheet	Size of Engraving	Color of Lines	Sheet	Ten
338. Tracing Paper, (No. 338 is old No. 348)	$8\frac{1}{2} \times 14$ in.	7×12 in.	orange		

The base line is divided into 366 equal parts, corresponding to the number of days per year (365 or 366). Heavy lines separate the twelve months, the names being printed at the head of each column, and every fifth day numbered. Of the 260 horizontal lines, every tenth line is heavy to facilitate reading.

ISOMETRIC CROSS SECTION PAPER.

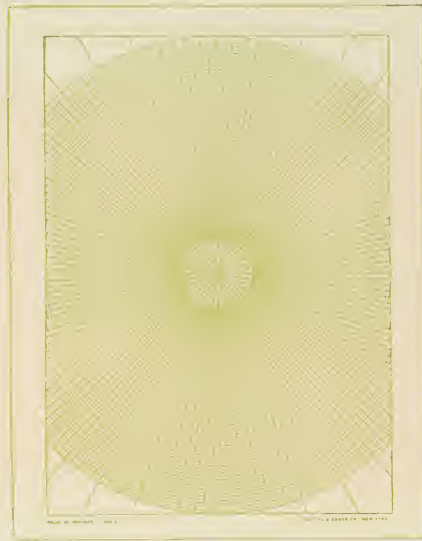


	Size of Sheet	Size of Engraving	Color of Lines	Sheet	Ten
342B. Tracing Paper,	$10\frac{3}{4} \times 13\frac{1}{4}$ in.	9×12 in.	green		
342C. Drawing Paper, medium	13×19	12×18	"		

For other Isometric Paper, see page 68.



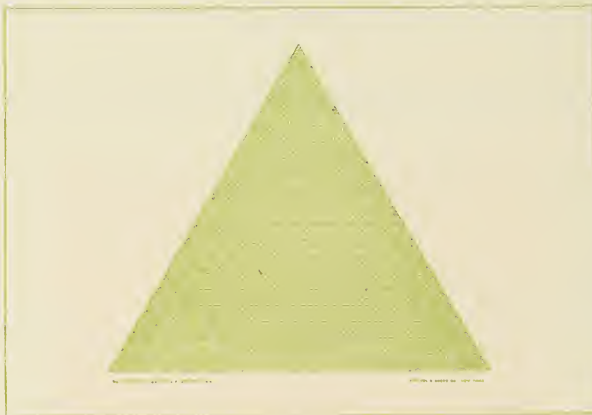
POLAR CO-ORDINATE PAPER.



	Size of Sheet	Size of Engraving	Color of Lines	Sheet	Ten
343A. Drawing Paper, medium	$8\frac{1}{2} \times 11$ in.	18×25 cm.	green		
343B. Tracing Paper,	"	"	"		

These papers are Degree Polar Co-ordinate, divided to 2° .

TRIANGULAR CO-ORDINATE PAPER.



	Size of Sheet	Size of Engraving	Color of Lines	Sheet	Ten
344 A. Tracing Paper,	$8\frac{1}{2} \times 12\frac{1}{4}$ in.	Side 200mm.	green		

For the graphical expression of three variables composing a constant sum. The engraving is an equilateral triangle, each side 200 mm. long, divided into 100 equal parts. These divisions are connected by rulings parallel to the sides, every fifth line heavy.

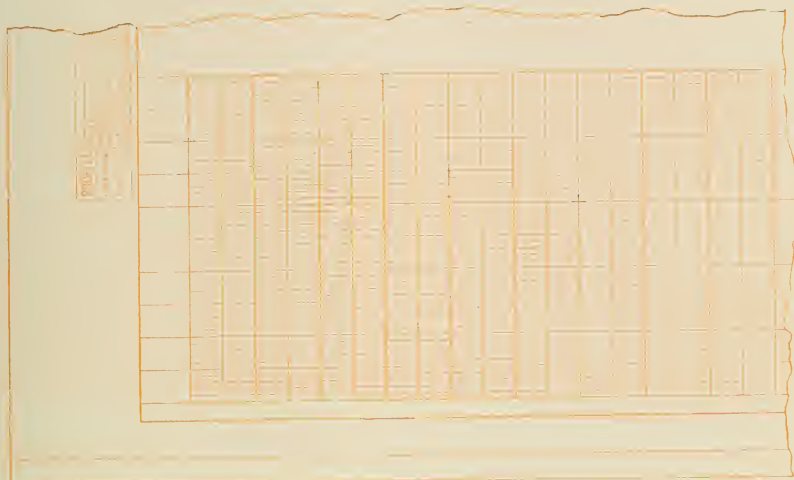
KEUFFEL & ESSER CO., NEW YORK

FEDERAL AID SHEETS

as recommended by the

U. S. DEPARTMENT OF AGRICULTURE,

OFFICE OF PUBLIC ROADS AND RURAL ENGINEERING.



No. 345-2

	Size of Sheet	Size of Profile	Color of Lines	Hundred sheets
345-1. Tracing Paper,*	23×36 in.	10×33½ in.	orange	

No. 345-1 is old No. 346-1P

346-1C. Imperial Tracing Cloth

“

“

“

Plan-Profile Sheets Nos. 345-1 and 346-1C have the vertical lines on the profile ruled at $\frac{1}{2}$ inch intervals, and the horizontal lines at $\frac{1}{10}$ inch intervals. Two titles for profile and plan at left hand side of sheet, outside of border line.

	Size of Sheet	Size of Profile	Color of Lines	Hundred sheets
345-2. Tracing Paper,*	23×36 in.	2 Profiles of	orange	
No. 345-2 is old No. 346-2P				
346-2C. Imperial Tracing Cloth	“	5×33½ in.	“	

Plan-Profile Sheets Nos. 345-2 and 346-2C are intended for flat profiles. The vertical lines on the profiles are ruled at $\frac{1}{2}$ inch intervals; and the horizontal lines at $\frac{1}{10}$ inch intervals. The lower quarter carries a profile; the second quarter is blank; the third quarter carries a profile and the fourth quarter is blank. Two titles for profile and plan at left hand side of sheet, outside the border line.

***Tracing Paper:** very high quality, 100% clean high grade rag stock, of great strength, which will withstand rough handling. Thickness, 22.†

For other Plan-Profile Papers, see page 51.

†The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thickness of the papers.



FEDERAL AID SHEETS

as recommended by the

U. S. DEPARTMENT OF AGRICULTURE,

OFFICE OF PUBLIC ROADS AND RURAL ENGINEERING.



No. 345-3.

	Size of Sheet	Size of Cross Section	Color of Lines	Hundred sheets
345-3. Tracing Paper,*	23×36 in.	21×33½ in.	orange	
No. 345-3 is old No. 346-3P.				
346-3C. Imperial Tracing Cloth	"	"	"	

Cross Section Sheets Nos. 345-3 and 346-3C are engraved 10×10 to the inch, with every tenth line heavy. The border line is 22×33½ inches. Two titles for Original Survey and Final Survey at left hand side of sheet, outside of border line.

	Size of Sheet	Size of Cross Section.	Color of Lines	Hundred sheets
345-4. Tracing Paper,*	23×36 in.	10×33½ in.	orange	
No. 345-4 is old No. 346-4P.				
346-4C. Imperial Tracing Cloth	"	"	"	

Plan-Cross Section Sheets Nos. 345-4 and 346-4C have the cross section engraving—10×10 to the inch, with every tenth line heavy—in the lower half of the sheet; the upper 11 inches inside the border being blank. The border line is 22×33½ inches. Two titles for Original Survey and Final Survey at left hand side of sheet, outside of border line.

***Tracing Paper:** very high quality, 100% clean high grade rag stock, of great strength, which will withstand rough handling. Thickness, 22. †

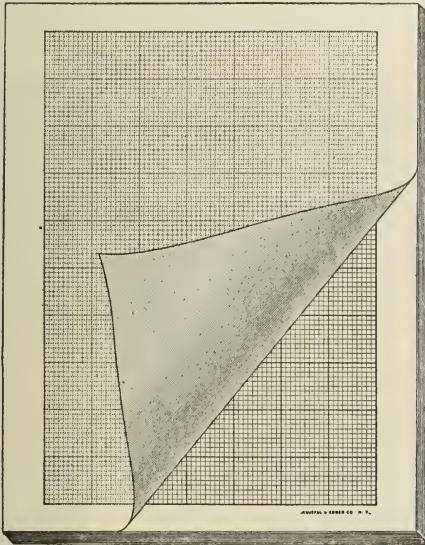
†The figures indicating thickness in 10000ths of an inch are not absolute, but merely show the approximate thickness of the paper.

KEUFFEL & ESSER CO., NEW YORK

K & E

REG. U. S. PAT. OFF.

TRANSPARENT SKETCHING PADS.



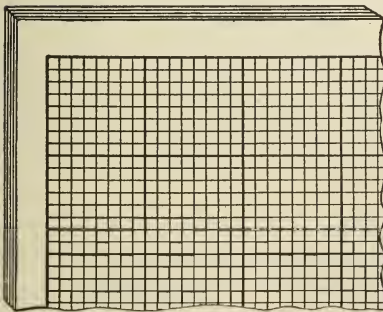
K & E Transparent Sketching Pads provide a simple and convenient medium for securing rapid and accurate sketches in Drafting, Designing, Engineering and Architectural work. In the school they enable the Student Draftsman to attain facility in freeland drawing and lettering. The sketches thus obtained are converted into permanent records by the simple process of blueprinting.

Each pad consists of 50 sheets of tracing paper, $8\frac{1}{2} \times 11$ in., on a backing of heavy cardboard; and each is provided with two sheets of cross section paper, $8\frac{1}{2} \times 11$ in., one divided to 2 mm., with black lines, the other divided 10×10 to the inch with black lines. The cross section sheet may be inserted behind each sheet of the pad in succession, thus serving as a very legible guide and scale for the sketches.

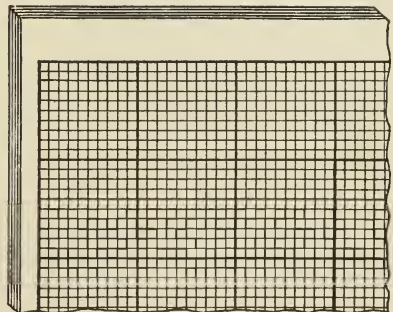
353B. K & E Transparent Sketching Pad, 50 sheets, $8\frac{1}{2} \times 11$ in., prepared tracing paper of medium thickness, with 2 cross section sheets. pad

For other sketching pads, see No. 178-11, 178L and 179T, page 32; and No. 197A-11, page 37.

CROSS SECTION PADS.

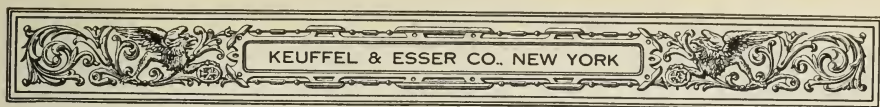


No. 353-8



353-10.

	Size of Sheet	Size of Plate	Color of Lines	Pad of sheets
	8 × 8 to 1 in.			
353-8. Drawing Paper, medium	$8\frac{1}{2} \times 11$ in.	8 × 10 in.	Blue	
	10 × 10 to 1 in.			
353-10. “ “ “		8 × 10 in.	“	



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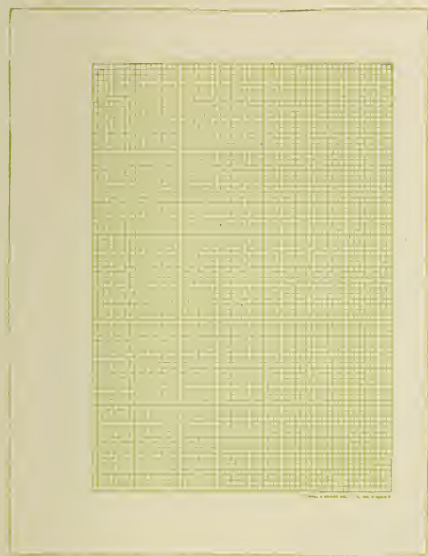
GRAPH SHEETS

K & E GRAPH SHEETS are intended for Graphic Charts, Statistics and similar purposes.

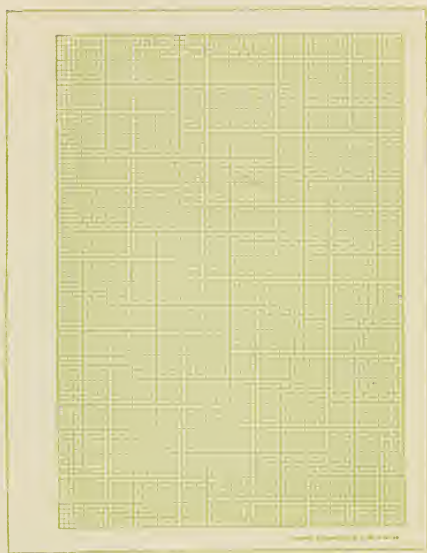
The Sheets are carried in three kinds of paper:

- (a) a strong white **drawing paper** of medium weight, and good erasing quality,
- (b) a fairly thin strong **tracing paper**,
- (c) a stronger and heavier **tracing paper** than (b), of 100% rag stock, highly transparent, from which excellent blue prints can be made.

All sheets are perforated to fit K & E binders 356 and 356L and the Irving-Pitt three ring binder.

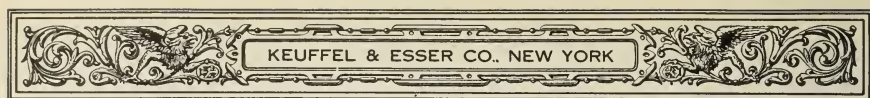


358-3



358-6

	Size of Sheet	Size of Plate	Color of Lines	Hund.	Ten
4×4 to 1 in., 4th lines heavy.					
358-1. Drawing Paper,	8½×11 in.	7×10 in.	green		
359-1. Tracing Paper,	"	"	orange		
5×5 to 1 in., 5th lines heavy.					
358-2. Drawing Paper,	8½×11 in.	7×10 in.	green		
359-2. Tracing Paper,	"	"	orange		



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GRAPH SHEETS

		Size of Sheet	Size of Plate	Color of Lines	Hund.	Ten
8×8 to 1 in., 8th lines heavy.						
358-3.	Drawing Paper,	8½×11 in.	7×10 in.	green		
358-3P.	" "	8½×11 in.	8×10 in.	blue	Pad of 24 sheets	
358-3L.	" "	11×16½ in.	10×15 in.	green	Hund.	Ten
359-3.	Tracing Paper,	8½×11 in.	7×10 in.	orange		
359-3L.	" "	11×16½ in.	10×15 in.	"		

10×10 to 1 in., all lines of same thickness.

358-4.	Drawing Paper,	8½×11 in.	7×10 in.	green		
359-4	Tracing Paper,	"	"	orange		

10×10 to 1 in., 10th lines heavy.

358-5.	Drawing Paper,	8½×11 in.	7×10 in.	green		
358-5P.	" "	8½×11 in.	8×10 in.	blue	Pad of 24 sheets	
358-5L.	" "	11×16½ in.	10×15 in.	green	Hund.	Ten
359-5.	Tracing Paper,	8½×11 in.	7×10 in.	orange		
359H-5.	Heavy Tracing Paper,	"	"	"		
359-5L.	Tracing Paper,	11×16½ in.	10×15 in.	"		

10×10 to 1 in., 5th lines heavy.

358-6.	Drawing Paper,	8½×11 in.	7×10 in.	green		
359-6.	Tracing Paper,	"	"	orange		
359H-6.	Heavy Tracing Paper,	"	"	"		

12×12 to 1 in., 6th lines accented, 12th lines heavy.

358-8.	Drawing Paper,	8½×11 in.	7×10 in.	green		
359-8.	Tracing Paper,	"	"	orange		

16×16 to 1 in., 16th lines heavy.

358-9.	Drawing Paper,	8½×11 in.	7×10 in.	green		
359-9.	Tracing Paper,	"	"	orange		

16×16 to 1 in., 8th lines heavy.

358-9½.	Drawing Paper,	8½×11 in.	7×10 in.	green		
358-9½L.	" "	11×16½ in.	10×15 in.	"		
359-9½.	Tracing Paper,	8½×11 in.	7×10 in.	orange		
359-9½L.	" "	11×16½ in.	10×15 in.	"		

20×20 to 1 in., all lines of same thickness.

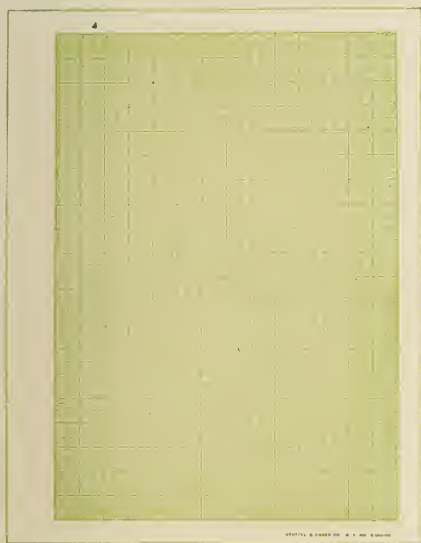
358-10.	Drawing Paper,	8½×11 in.	7×10 in.	green		
359-10.	Tracing Paper,	"	"	orange		

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GRAPH SHEETS



358-11

358-21

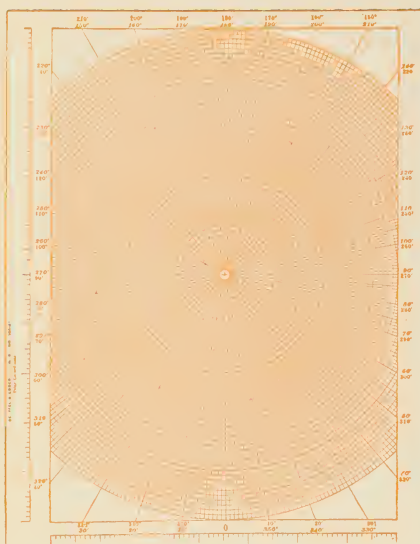
	Size of Sheet	Size of Plate	Color of Lines	Hund.	Ten
20×20 to 1 in., 5th lines accented, 10th lines heavy.					
358-11. Drawing Paper,	8½×11 in.	7×10 in.	green		
358-11L. “ “	11×16½ in.	10×15 in.	“		
359-11. Tracing Paper,	8½×11 in.	7×10 in.	orange		
359H-11. Heavy Tracing Paper,	“	“	“		
359-11K. Tracing Paper,	“	“	black		
359-11L. Tracing Paper,	11×16½ in.	10×15 in.	orange		
10×10 to ½ in., 10th lines heavy.					
358-12. Drawing Paper,	8½×11 in.	7½×10 in.	green		
359-12. Tracing Paper,	“	“	orange		
359H-12. Heavy Tracing Paper,	“	“	“		
359-12G. Tracing Paper,	“	“	green		
Millimeters, Centimeter lines heavy.					
358-14. Drawing Paper,	8½×11 in.	18×25 cm.	green		
358-14L. “ “	11×16½ in.	25×38 cm.	“		
359-14. Tracing Paper,	8½×11 in.	18×25 cm.	orange		
359H-14. Heavy Tracing Paper,	“	“	“		
359-14L. Tracing Paper,	11×16½ in.	25×38 cm.	“		
2 Millimeters, Centimeter lines heavy.					
358-15. Drawing Paper,	8½×11 in.	18×24 cm.	black		



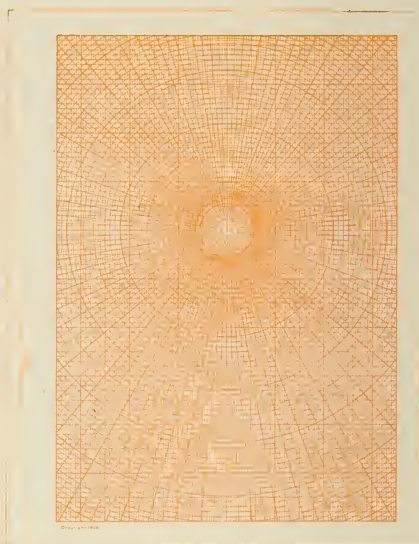
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GRAPH SHEETS

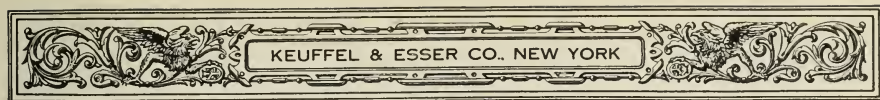


359-31



359-31 1/2

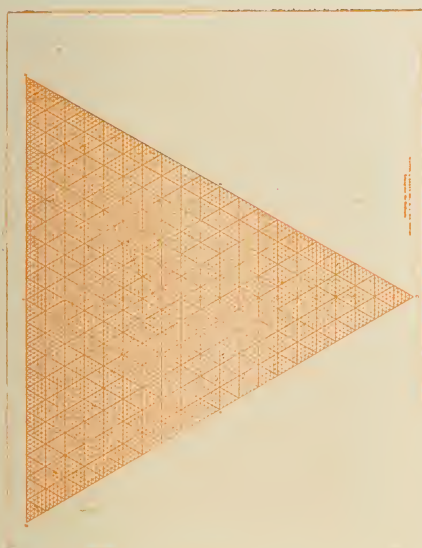
	Size of Sheet	Size of Plate	Color of Lines	Hund.	Ten
6×8 divisions per unit.					
162 divisions short side, every 6th line heavy, equivalent to 27 weeks of 6 days each; 200 divisions long side, every 8th line heavy and every 2nd line accented. For charting prices of stock and bonds.					
358-17. Drawing Paper,	8 1/2 × 11 in.	7 3/8 × 10 in.	green		
359-17. Tracing Paper,	"	"	orange		
6×10 divisions per unit.					
318 divisions long side, every 6th line heavy, equivalent to 53 weeks of 6 days each; 200 divisions short side, every 8th line heavy and every 2nd line accented. For charting prices of stock and bonds.					
358-17L. Drawing Paper,	11 × 16 1/2 in.	10 × 15 in.	green		
359-17L. Tracing Paper,	"	"	orange		
10×12 to 1 in.					
10 divisions per inch short side, 5th lines heavy—12 per inch long side, 6th lines heavy.					
358-20. Drawing Paper,	8 1/2 × 11 in.	7 × 10 in.	green		
359-20. Tracing Paper,	"	"	orange		
12×20 to 1 in.					
12 divisions per inch long side 6th lines accented, 12th lines heavy—20 per inch short side, 10th lines heavy.					
358-21. Drawing Paper,	8 1/2 × 11 in.	7 × 10 in.	green		
358-21L. Drawing Paper,	11 × 16 1/2 in.	10 × 15 in.	green		
359-21. Tracing Paper,	8 1/2 × 11 in.	7 × 10 in.	orange		
359-21L. Tracing Paper,	11 × 16 1/2 in.	10 × 15 in.	orange		
Isometric					
358-30. Drawing Paper,	8 1/2 × 11 in.	7 × 10 in.	green		
359-30. Tracing Paper,	"	"	orange		



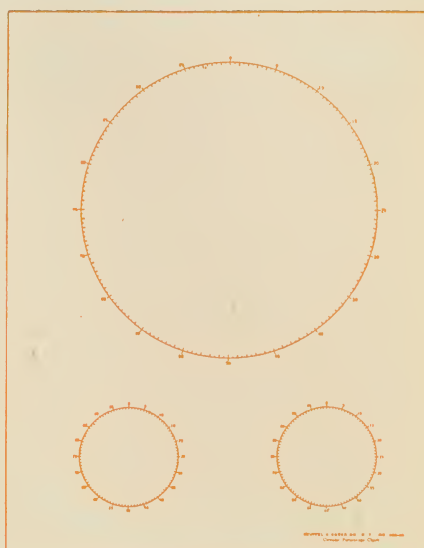
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GRAPH SHEETS



359-32



359-35

Size of Sheet	Size of Plate	Color of Lines	Hund.	Ten
---------------	---------------	----------------	-------	-----

Polar Co-Ordinate.

Divided to single degrees, numbered every 10 degrees in both directions. Ordinates divided to 10 parts to the inch. Outside of main engraving are 2 scales divided 10 parts to the inch, one on long dimension and one on short dimension.

- | | | | | |
|-------------------------------|------------------------------|------------|--------|--|
| 358-31. Drawing Paper, | $8\frac{1}{2} \times 11$ in. | 7 × 10 in. | green | |
| 359-31. Tracing Paper, | " | " | orange | |

Fluxolite Paper,

For rapidly determining results in lighting problems, as flux determinations, flux in light beams, etc; for mapping space relations between light source and points of illumination; and for point by point method of illumination calculation.

- | | | | | |
|--------------------------------|------------------------------|------------|--------|--|
| 359-31½. Tracing Paper, | $8\frac{1}{2} \times 11$ in. | 7 × 10 in. | orange | |
|--------------------------------|------------------------------|------------|--------|--|

Triangular Co-Ordinate.

All 3 dimensions divided into 100 parts, each properly numbered at every 5th division. For plating a curve composed of 3 variables whose sum is always constant.

- | | | | | |
|-------------------------------|------------------------------|-----------------|--------|--|
| 358-32. Drawing Paper, | $8\frac{1}{2} \times 11$ in. | Altitude 20 cm. | green | |
| 359-32. Tracing Paper, | " | " | orange | |

Circular Percentage.

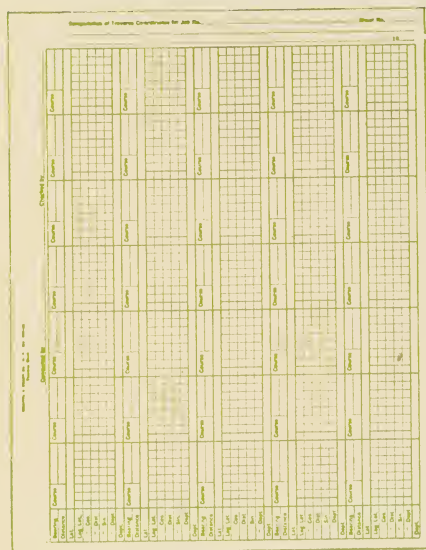
3 Circles—one 6 in. dia., circumference divided into 100 divisions, with 2 parts to each division, numbered from 0 to 100; two 2 in. dia., with circumference divided into 100 parts, numbered 0 to 100. For "pie" charts, showing percentages by sectors.

- | | | | | |
|-------------------------------|------------------------------|---|--------|--|
| 358-35. Drawing Paper, | $8\frac{1}{2} \times 11$ in, | — | green | |
| 359-35. Tracing Paper, | " | — | orange | |

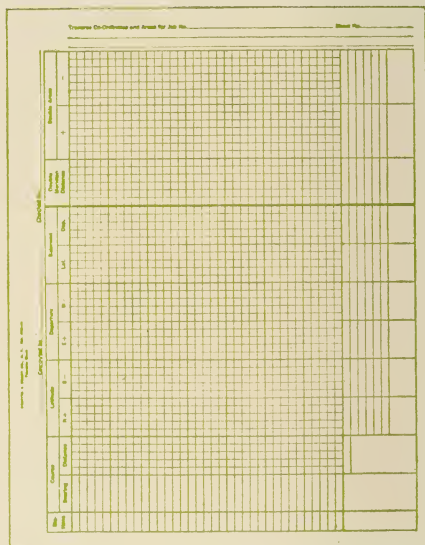


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GRAPH SHEETS



358-40



358-41

Size of
Sheet

Size of
Plate

Color of
Lines

Hund.

Ten

Traverse Sheets.

For recording the computations involving the latitudes and departures of the courses.

- | | | | | |
|----------------|----------------|------------------------------|------------------------------|--------|
| 358-40. | Drawing Paper, | $8\frac{1}{2} \times 11$ in. | $7\frac{1}{2} \times 10$ in. | green |
| 359-40. | Tracing Paper, | " | " | orange |

For recording the co-ordinates of the Traverse —
Angle, Bearing, Distance, Northings, Southings, Double Areas, etc.

- | | | | | |
|----------------|----------------|------------------------------|--|--------|
| 358-41. | Drawing Paper, | $8\frac{1}{2} \times 11$ in. | $7\frac{3}{4} \times 9\frac{3}{4}$ in. | green |
| 359-41. | Tracing Paper, | " | " | orange |

Township Paper

Showing complete township, with sections properly numbered, quarter sections, etc., scale 1 in. = 1 mi.

- | | | | | |
|----------------|----------------|------------------------------|------------------|-------|
| 358-44. | Drawing Paper, | $8\frac{1}{2} \times 11$ in. | 6×6 in. | black |
| 359-44. | Tracing Paper, | " | " | " |

Reactance-Frequency. Standard Graph Sheet, Bell Laboratories.

A logarithmic paper especially designed to solve quickly the relationships between reactance, capacitance, inductance and frequency.

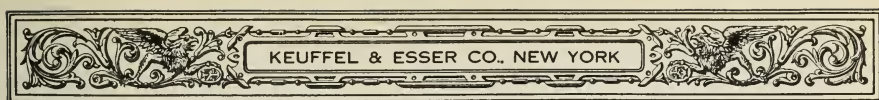
- | | | | | |
|-----------------|----------------------|------------------------------|-----------------------------|--------|
| 358-47. | Drawing Paper, | $8\frac{1}{2} \times 11$ in. | $5\frac{3}{4} \times 8$ in. | green |
| 359-47. | Tracing Paper, | " | " | orange |
| 359H-47. | Heavy Tracing Paper, | " | " | " |

Semi-Logarithmic. One 10 in. Log scale long side, 60 divisions
short side, with 6th lines heavy,

- | | | | | |
|----------------|----------------|------------------------------|-------------------|--------|
| 358-50. | Drawing Paper, | $8\frac{1}{2} \times 11$ in. | 7×10 in. | green |
| 359-50. | Tracing Paper, | " | " | orange |

Semi-Logarithmic. One 10 in. Log scale long side, 10 divisions per inch
short side, with 10th lines heavy.

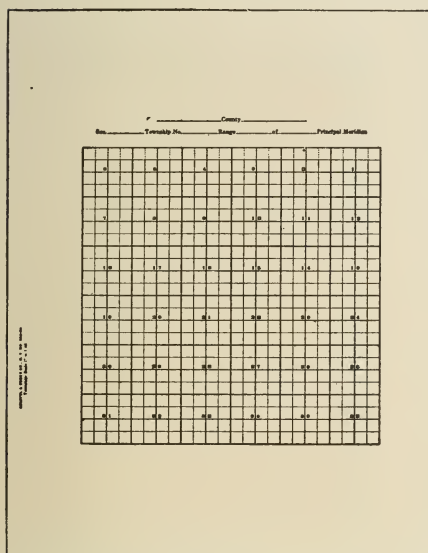
- | | | | | |
|----------------|----------------|------------------------------|-------------------|--------|
| 358-51. | Drawing Paper, | $8\frac{1}{2} \times 11$ in. | 7×10 in. | green |
| 359-51. | Tracing Paper, | " | " | orange |



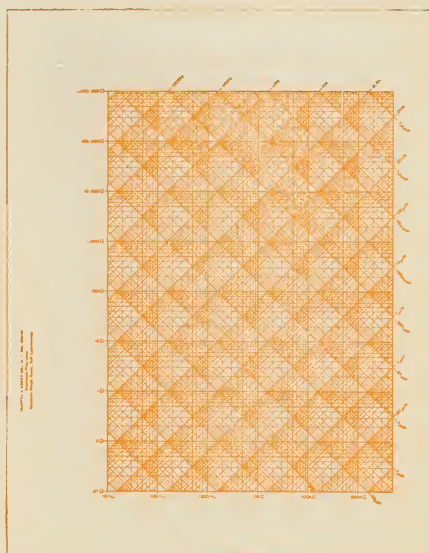
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GRAPH SHEETS



358-44



359-44

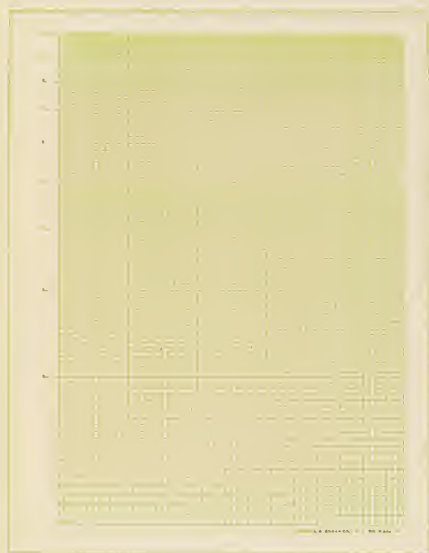
359-47

	Size of Sheet	Size of Plate	Color of Lines	Hund.	Ten
Semi-Logarithmic. One 10 in. Log scale on 10 in. side, 12 divisions per inch other side, with 6th lines heavy.					
358-52. Drawing Paper,	$8\frac{1}{2} \times 11$ in.	7×10 in.	green		
358-52 L. " "	$11 \times 16\frac{1}{2}$ "	10×15 in.	"		
359-52. Tracing Paper,	$8\frac{1}{2} \times 11$ in.	7×10 in.	orange		
359-52 L. " "	$11 \times 16\frac{1}{2}$ "	10×15 in.	"		
Semi-Logarithmic. Two 5 in. Log scales long side, 60 divisions short side, with 6th lines heavy.					
358-60. Drawing Paper,	$8\frac{1}{2} \times 11$ in.	7×10 in.	green		
359-60. Tracing Paper,	"	"	orange		
Semi-Logarithmic. Two 5 in. Log scales long side, 10 divisions per inch short side, with every 10th line heavy.					
358-61. Drawing Paper,	$8\frac{1}{2} \times 11$ in.	7×10 in.	green		
359-61. Tracing Paper,	"	"	orange		
Semi-Logarithmic. Two 5 in. Log scales 10 in. side, 12 divisions per inch other side, with every 6th line heavy.					
358-62. Drawing Paper,	$8\frac{1}{2} \times 11$ in.	7×10 in.	green		
358-62 L. " "	$11 \times 16\frac{1}{2}$ "	10×15 in.	"		
359-62. Tracing Paper,	$8\frac{1}{2} \times 11$ in.	7×10 in.	orange		
359-62 L. " "	$11 \times 16\frac{1}{2}$ "	10×15 in.	"		
Semi-Logarithmic. Two 5 in. Log scales long side, 20 divisions per inch short side, with 10th lines heavy.					
358-63. Drawing Paper,	$8\frac{1}{2} \times 11$ in.	7×10 in.	green		
359-63. Tracing Paper,	"	"	orange		
Semi-Logarithmic. Two $3\frac{3}{4}$ in. Log scales short side, 20 divisions per inch long side, with 10th lines heavy.					
358-64. Drawing Paper,	$8\frac{1}{2} \times 11$ in.	$7\frac{1}{2} \times 10$ in.	green		
359-64. Tracing Paper,	"	"	orange		

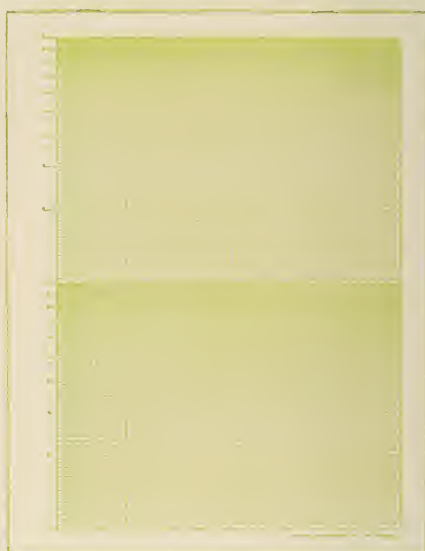


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GRAPH SHEETS



358-50



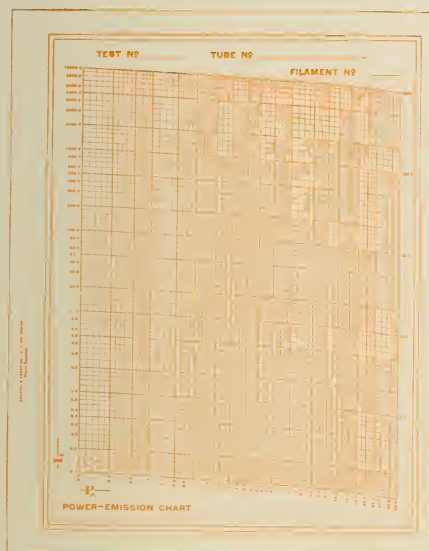
358-60

	Size of Sheet	Size of Plate	Color of Lines	Hund.	Ten
Semi-Logarithmic. Three $8\frac{1}{2}$ in. Log scales long side, 60 divisions short side, with 6th lines heavy.					
358-70. Drawing Paper,	$8\frac{1}{2} \times 11$ in.	18×25 cm.	green		
359-70. Tracing Paper,	"	"	orange		
Semi-Logarithmic. Three $3\frac{1}{2}$ in. Log scales long side, 10 divisions per inch short side, with 10th lines heavy.					
358-71. Drawing Paper,	$8\frac{1}{2} \times 11$ in.	7×10 in.	green		
359-71. Tracing Paper,	"	"	orange		
359H-71. Heavy Tracing Paper,	"	"	"		
Semi-Logarithmic. Three $3\frac{1}{2}$ in. Log scales, 10 inch side, 12 divisions per inch other side, with 6th lines heavy.					
358-72. Drawing Paper,	$8\frac{1}{2} \times 11$ in.	7×10 in.	green		
358-72L. " "	$11 \times 16\frac{1}{2}$ "	10×15 in.	"		
359-72. Tracing Paper,	$8\frac{1}{2} \times 11$ in.	7×10 in.	orange		
359-72L. " "	$11 \times 16\frac{1}{2}$ "	10×15 in.	"		
Semi-Logarithmic. Three $3\frac{1}{2}$ in. Log scales short side, 20 divisions per inch long side, with 10th lines heavy and 5th lines accented.					
358-73L. Drawing Paper,	$11 \times 16\frac{1}{2}$ in.	10×15 in.	green		
359-73L. Tracing Paper,	"	"	orange		
Semi-Logarithmic. Four $2\frac{1}{2}$ in. Log scales long side, 60 divisions short side, with 6th lines heavy.					
358-N80. Drawing Paper,	$8\frac{1}{2} \times 11$ in.	7×10 in.	green		
359-N80. Tracing Paper,	"	"	orange		
Semi-Logarithmic. Four $2\frac{1}{2}$ in. Log scales long side, 10 divisions per inch short side, with 10th lines heavy.					
358-81. Drawing Paper,	$8\frac{1}{2} \times 11$ in.	7×10 in.	green		
359-81. Tracing Paper,	"	"	orange		

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GRAPH SHEETS



359-98

Semi-Logarithmic.

Size of Sheet Four $2\frac{1}{4}$ in. Log scales long side, 12 divisions per inch short side, with 6th lines heavy.

359-99

Color of Lines Hund. Ten

358-82. Drawing Paper,
359-82. Tracing Paper,
Semi-Logarithmic.

Size of Plate Five 2 in. Log scales long side, 10 divisions per inch short side, with 10th lines heavy.

358-91. Drawing Paper,
359-91. Tracing Paper,
Semi-Logarithmic.

Size of Plate Five 1.8 in. Log scales long side, 12 divisions per inch short side, with 6th lines heavy.

358-92. Drawing Paper,
359-92. Tracing Paper,
Semi-Logarithmic.

Size of Plate Five 3 in. Log scales long side, 6 divisions per inch short side, with 6th lines heavy.

358-94L. Drawing Paper,
359-94L. Tracing Paper,

(Nos. 358-94L and 359-94L are old Nos. 358-97L and 359-97L)
Semi-Logarithmic. Seven $1\frac{1}{4}$ in. Log scales long side, 10 divisions per inch short side, with 10th lines heavy.

358-96. Drawing Paper,
359-96. Tracing Paper,

Size of Plate $8\frac{1}{2} \times 11$ in. $6 \times 8\frac{3}{4}$ in. green orange

Power-Emission.

The standard chart of the Institute of Radio Engineers for plating the relation between emission current and filament power of vacuum tubes by extrapolation.

358-98. Drawing Paper,
359-98. Tracing Paper,

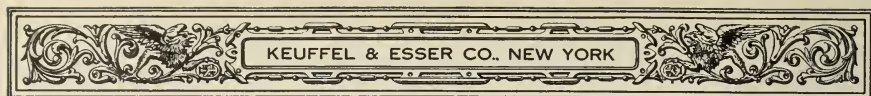
Size of Plate $8\frac{1}{2} \times 11$ in. $6\frac{3}{8} \times 8\frac{3}{16}$ in. green orange

Radio Receiver Performance.

Standard Graph Sheet, Institute of Radio Engineers for graphically indicating the fidelity, sensitivity and selectivity of radio receivers.

358-99. Drawing Paper,
359-99. Tracing Paper,

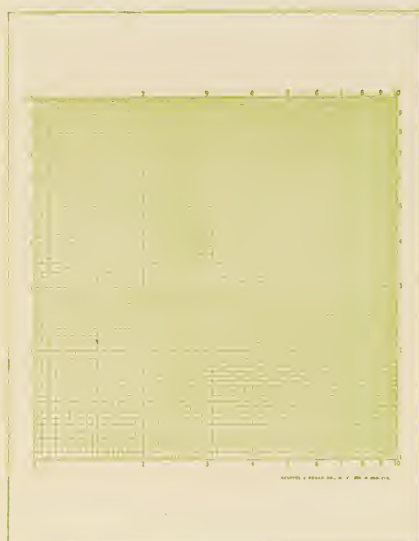
Size of Plate $8\frac{1}{2} \times 11$ in. $6 \times 8\frac{3}{4}$ in. green orange



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GRAPH SHEETS

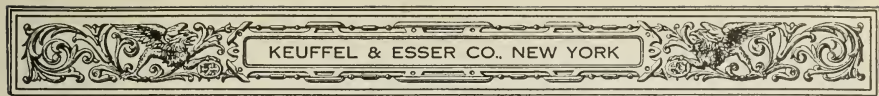


358-100



358-120

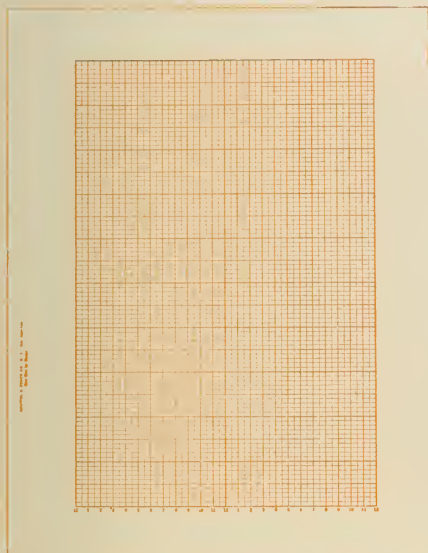
		Size of Sheet	Size of Plate	Color of Lines	Hund.	Ten
	Logarithmic.	One $7\frac{1}{2}$ in. Log scale horizontally and vertically.				
358-100.	Drawing Paper,	$8\frac{1}{2} \times 11$ in.	$7\frac{1}{2} \times 7\frac{1}{2}$ in.	green		
359-100.	Tracing Paper,	"	"	orange		
	Logarithmic.	One 5 in. Log Scale in width by Two 5 in. Log Scales in length.				
358-103.	Drawing Paper,	$8\frac{1}{2} \times 11$ in.	5×10 in.	green		
359-103.	Tracing Paper,	"	"	orange		
	Logarithmic.	Two $3\frac{3}{4}$ in. Log Scales horizontally and two $3\frac{3}{4}$ in. Log Scales vertically.				
358-110.	Drawing Paper,	$8\frac{1}{2} \times 11$ in.	$7\frac{1}{2} \times 7\frac{1}{2}$ in.	green		
359-110.	Tracing Paper,	"	"	orange		
	Logarithmic.	Two 5 in. Log Scales horizontally and two 5 in. Log Scales vertically.				
358-110L.	Drawing Paper,	$11 \times 16\frac{1}{2}$ in.	10×10 in.	green		
359-110L.	Tracing Paper,	"	"	orange		
	Logarithmic.	$2\frac{3}{4}$ — $3\frac{3}{4}$ in. Log Scales horizontally and 2 — $3\frac{3}{4}$ in. Log Scales vertically.				
358-111.	Drawing Paper,	$8\frac{1}{2} \times 11$ in.	$7\frac{1}{2} \times 10\frac{5}{8}$ in.	green		
359-111.	Tracing Paper,	"	"	orange		
	Logarithmic.	Three 5 in. Log Scales horizontally by Two 5 in. Log Scales vertically.				
358-112L.	Drawing Paper,	$11 \times 16\frac{1}{2}$ in.	10×15 in.	green		
359-112L.	Tracing Paper,	"	"	orange		
	Logarithmic.	Three $2\frac{1}{2}$ in. Log Scales horizontally and three $2\frac{1}{2}$ in. Log Scales vertically.				
358-120.	Drawing Paper,	$8\frac{1}{2} \times 11$ in.	$7\frac{1}{2} \times 7\frac{1}{2}$ in.	green		
359-120.	Tracing Paper,	"	"	orange		



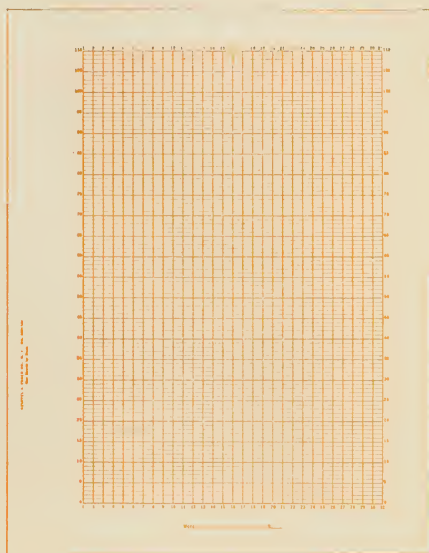
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GRAPH SHEETS



359-130



359-134

	Size of Sheet	Size of Plate	Color of Lines	Hund.	Ten
Logarithmic. Five 3 in. Log scales horizontally and three 3 in. Log scales vertically.					
358-125 L. Drawing Paper,	11×16½ in.	9×15 in.	green		
359-125 L. Tracing Paper,	"	"	orange		

One Day by Hours.

24 hours by half hours short side, hours numbered; 100 divisions long side, with 10th lines heavy, 5th lines accented.

358-130. Drawing Paper,	8½×11 in.	6×9 in.	green
359-130. Tracing Paper,	"	"	orange

One Week by Hours.

168 divisions short side, with 6th lines heavy; 200 divisions long side, with 10th lines heavy and 5th lines accented.

358-132 L. Drawing Paper,	11×16½ in.	10×14½ in.	green
359-132 L. Tracing Paper,	"	"	orange

One Month by Days.

31 divisions short side, numbered 1 to 31; 110 divisions long side, numbered at every 5th division, with 5th lines heavy.

358-134. Drawing Paper,	8½×11 in.	6×9½ in.	green
359-134. Tracing Paper,	"	"	orange

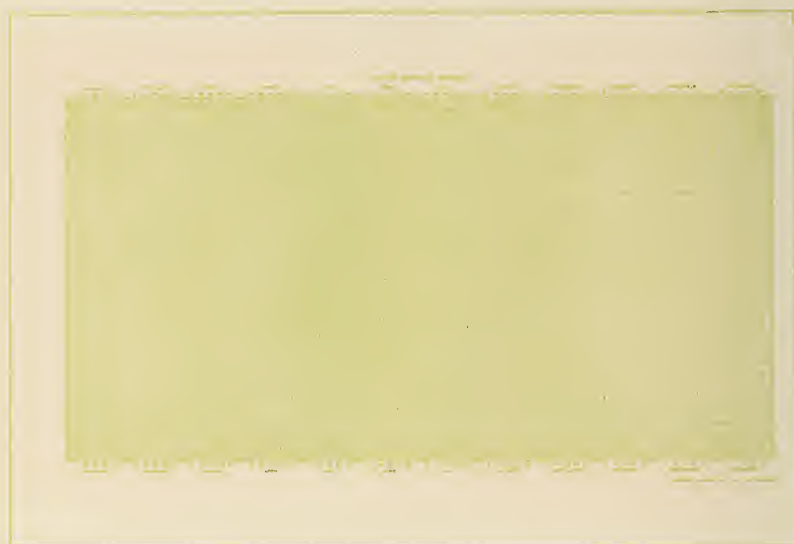
Weekly-Monthly.

2 Plates, each 5×7½ in., divided on short side into 60 parts with 5th lines heavy.
One chart divided on long side into 96 parts, with 4th lines heavy;
the other into 132 parts with 12th lines heavy.

358-136. Drawing Paper,	8½×11 in.	2 of 5×7½ in.	green
359-136. Tracing Paper,	"	"	orange



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GRAPH SHEETS



358-141L

Size of Sheet	Size of Plate	Color of Lines	Hund.	Ten
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Six Months by Days.

Six calendar months, Jan. to June. Every 5th day numbered and accented; months printed. Divided on short side into 90 parts (10 per inch), with 10th lines heavy and 5th lines accented.

358-137L.	Drawing Paper,	11×16½ in.	9×13½ in.	green
359-137L.	Tracing Paper,	"	"	orange

Six calendar months, July to Dec. Otherwise divided and arranged like 137L.

358-138L.	Drawing Paper,	11×16½ in.	9×13¾ in.	green
359-138L.	Tracing Paper,	"	"	orange

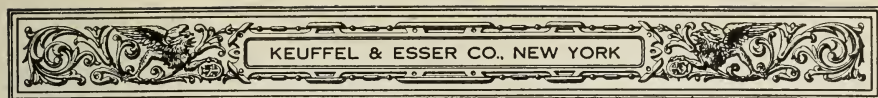
Divided on long side, into 6 months of 31 days, with every 5th day numbered. Divided on short side into 120 parts, with each 10th line heavy. Boxes in which names of months can be written or lettered.

358-139.	Drawing Paper,	8½×11 in.	7×10 in.	green
359-139.	Tracing Paper,	"	"	orange

One Year by Days.

Any fiscal year. Divided on long side into 372 days; heavy lines between months; every 5th day numbered. Divided on short side into 180 parts (10 per unit) with 10th lines heavy and 5th lines accented.

358-140L.	Drawing Paper,	11×16½ in.	9×14 in.	green
359-140L.	Tracing Paper,	"	"	orange



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GRAPH SHEETS



359-150L

Size of Sheet	Size of Plate	Color of Lines	Hund.	Ten
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One Year by Days (continued)

Calendar Year. Divided on long side into 366 days, with 5th days numbered and months printed. Divided on short side into 150 parts (10 per unit), with 10th lines heavy and 5th lines accented.

358-141 L.	Drawing Paper,	11×16½ in.	7½×14½ in.	green
359-141 L.	Tracing Paper,	"	"	orange

Similar to 141 L, but divided on short side into 250 parts (10 per unit).

358-142.	Drawing Paper,	8½×11 in.	6½×9 in.	green
359-142.	Tracing Paper,	"	"	orange

Similar to 141 L, but divided on short side into 200 parts (8 per unit) with 8th lines heavy and 4th lines accented.

358-143 L.	Drawing Paper,	11×16½ in.	9×14 in.	green
359-143 L.	Tracing Paper,	"	"	orange

Divided and marked on long side like 140 L. Three 3 in. Log Scales short side.

358-150 L.	Drawing Paper,	11×16½ in.	9×14 in.	green
359-150 L.	Tracing Paper,	"	"	orange

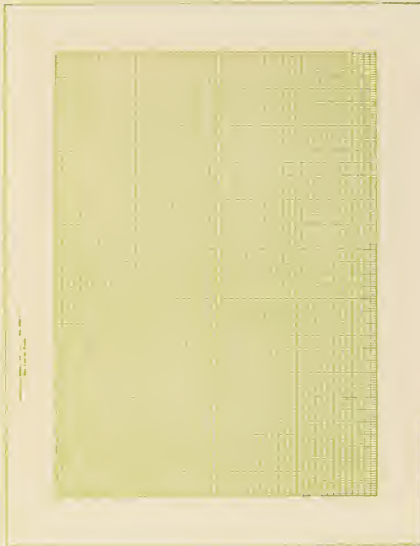
Divided and marked on long side like 141 L. Three 3 in. Log Scales short side.

358-151 L.	Drawing Paper,	11×16½ in.	9×14 in.	green
359-151 L.	Tracing Paper,	"	"	orange

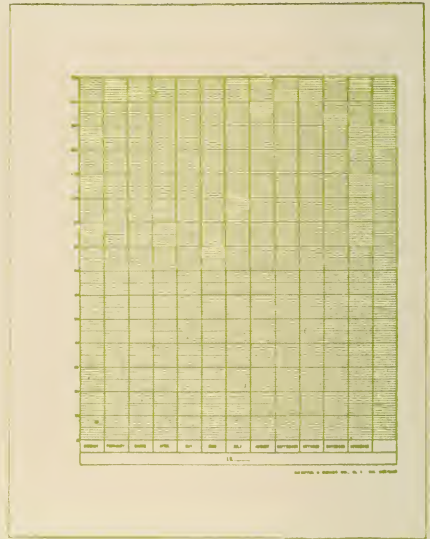


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GRAPH SHEETS



358-160



358-170

Size of Sheet	Size of Plate	Color of Lines	Hund.	Ten
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One Year by Weeks.

Divided on short side into 52 parts with 13th lines ($\frac{1}{4}$ year) heavy, and on long side into 180 parts, with 10th lines heavy and 5th lines accented.

358-160. Drawing Paper,	$8\frac{1}{2} \times 11$ in.	$6\frac{1}{2} \times 9$ in.	green	
359-160. Tracing Paper,	"	"	orange	

One Year by Months.

Divided on short side into 13 parts, with names of months in 12 parts; divided on long side into 150 parts with 10th lines heavy and numbered.

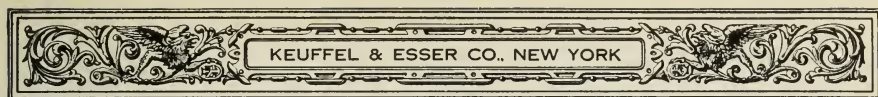
358-170. Drawing Paper,	$8\frac{1}{2} \times 11$ in.	$6\frac{1}{2} \times 8$ in.	green	
359-170. Tracing Paper,	"	"	orange	

Similar to 170 but months running the long side of the paper. Divided on short side into 100 parts, with 10th lines heavy and numbered.

358-171. Drawing Paper,	$8\frac{1}{2} \times 11$ in.	$6\frac{1}{2} \times 9\frac{1}{2}$ in.	green	
359-171. Tracing Paper,	"	"	orange	

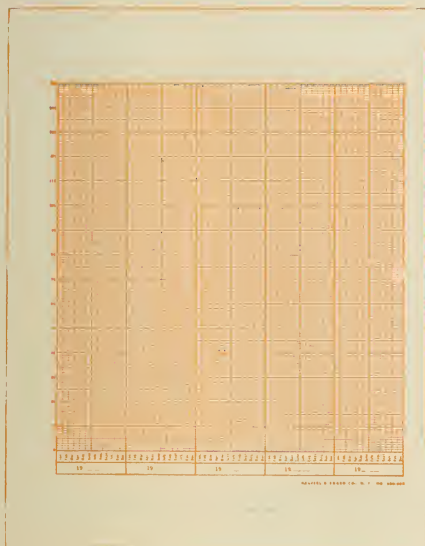
Similar to 170, but has three 3 in. Log scales long side.

358-175. Drawing Paper,	$8\frac{1}{2} \times 11$ in.	$6\frac{1}{2} \times 9\frac{1}{2}$ in.	green	
359-175. Tracing Paper,	"	"	orange	

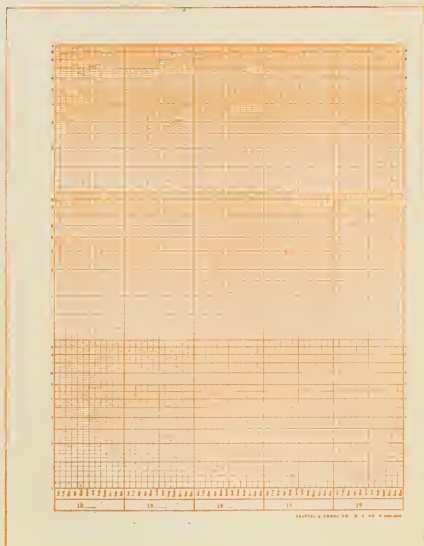


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GRAPH SHEETS



359-190



359-195

	Size of Sheet	Size of Plate	Color of Lines	Hund.	Ten
Three Years by Months.					

Divided on short side into 36 parts, and on long side into 100 parts with 5th lines heavy and 10th lines numbered. Months marked. Spaces for years.

358-180.	Drawing Paper,	$8\frac{1}{2} \times 11$ in.	6×9 in.	green	
359-180.	Tracing Paper,	"	"	orange	

Five Years by Months.

Divided on short side into 60 parts, and on long side into 150 parts with 10th lines heavy and numbered. Months marked. Spaces for years.

358-190.	Drawing Paper,	$8\frac{1}{2} \times 11$ in.	7×8 in.	green	
359-190.	Tracing Paper,	"	"	orange	

Similar to 190, but months running long way of paper. Divided on short side into 100 parts, 10th lines heavy and numbered.

358-192.	Drawing Paper,	$8\frac{1}{2} \times 11$ in.	$6\frac{1}{2} \times 10$ in.	green	
358-192L.	" "	$11 \times 16\frac{1}{2}$ in.	$9\frac{1}{2} \times 14$ in.	"	
359-192.	Tracing Paper,	$8\frac{1}{2} \times 11$ in.	$6\frac{1}{2} \times 10$ in.	orange	
359-192L.	" "	$11 \times 16\frac{1}{2}$ in.	$9\frac{1}{2} \times 14$ in.	"	

Similar to 190, but three 3 in. Log scales long side.

358-195.	Drawing Paper,	$8\frac{1}{2} \times 11$ in.	18×24 cm.	green	
359-195.	Tracing Paper,	"	"	orange	



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GRAPH SHEETS



358-221.

Size of Sheet	Size of Plate	Color of Lines	Hund.	Ten
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Ten Years by Months.

Divided on long side into 120 parts and on short side into 110 parts with 10th lines heavy and numbered. Months marked. Spaces for years.

358-200L. Drawing Paper,	11×16½ in.	9¾×14 in.	green	
359-200L. Tracing Paper,	"	"	orange	

Similar to 200 L, but three 3 in. Log scales on short side.

358-205 L. Drawing Paper,	11×16½ in.	9½×14 in.	green	
359-205 L. Tracing Paper,	"	"	orange	

Twenty Years by Months.

Divided on long side into 240 parts, with months Mar., June, Sept. and Dec. printed throughout. Divided on short side into 110 parts with 10th lines heavy and numbered.

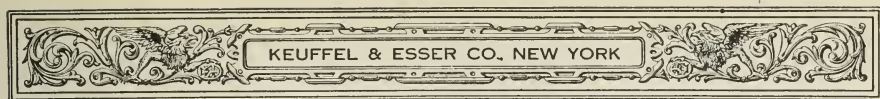
358-210L. Drawing Paper,	11×16½ in.	9¾×14 in.	green	
359-210L. Tracing Paper,	"	"	orange	

Divided and marked on long side like No. 210L. Two 4.625 in. Log scales on short side.

358-214L. Drawing Paper,	11×16½ in.	9¾×14 in.	green	
359-214L. Tracing Paper,	"	"	orange	

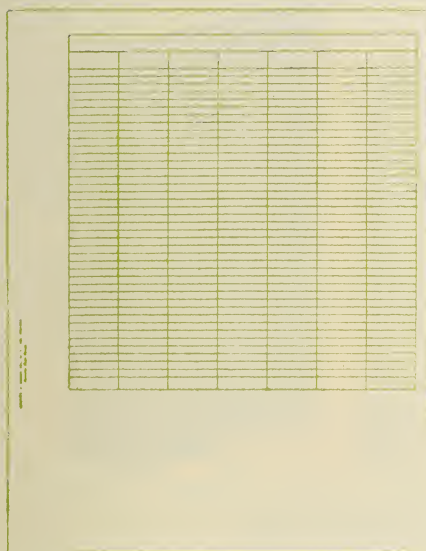
Divided and marked on long side like No. 210L. Three 3.1 in. Log scales on short side

358-215L. Drawing Paper,	11×16½ in.	9¾×14 in.	green	
359-215L. Tracing Paper,	"	"	orange	

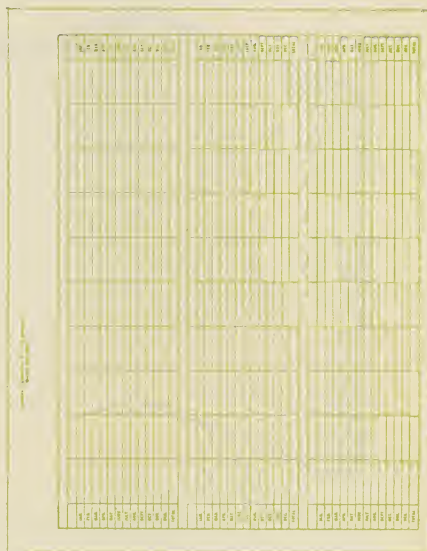


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GRAPH SHEETS



358-230



358-240

		Size of Sheet	Size of Plate	Color of Lines	Hund.	Ten
Ruled Papers.						
358-220.	Drawing Paper,	8½×11 in.	Lines only, ruled blue.			
358-221.	“ “	“	5×5 per in., ruled blue, 5th lines heavy.			
Plain Papers.						
358-226.	Drawing Paper,	8½×11 in.	Blank.			
359-226.	Tracing Paper,	“	“			

General Data Sheet

Divided into 7 columns on the short side and into 43 spaces for headings, figures and totals on the long side, with a clear space of $3\frac{3}{8}$ in. below the engraving for notes.

358-230. Drawing Paper, $8\frac{1}{2} \times 11$ in. $7 \times 7\frac{3}{16}$ in green

Monthly Data Sheet

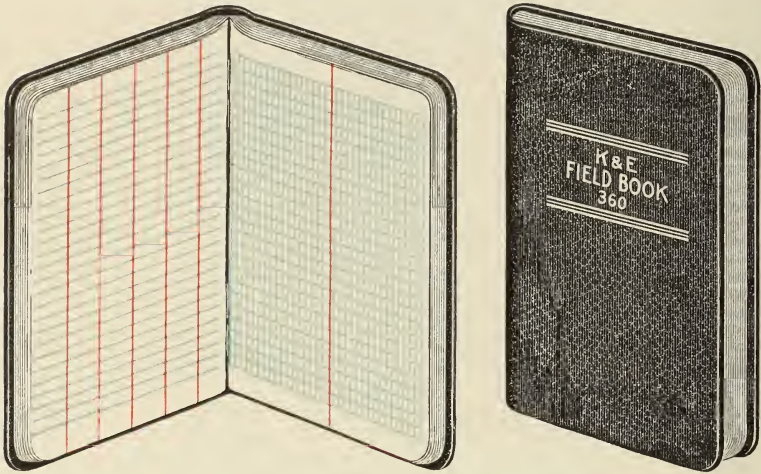
Divided into 10 columns on the long side, with the names of the months in separate columns at the right and left. Three separate sections of 12 months, each with extra spaces for headings and totals on the short dimension. Each face of the sheet has the complete engraving as above described

358-240. Drawing Paper, $8\frac{1}{2} \times 11$ in. $7\frac{1}{2} \times 10$ in. green



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ENGINEER'S FIELD BOOKS

The paper used in all K & E Engineer's Field Books is **waterproofed**, i. e. the surface of the paper is not affected by moisture and rain, to which such books may be exposed in the field. The surface of paper that is not waterproof will easily rub off when wet or moist, and valuable records may thereby be destroyed. This quality may be tested by wetting the surface with a few drops of water and rubbing it with the finger.

ENGRAVING.— The pages in the K & E Engineer's Field Books are printed from engraved plates to insure accuracy of spacing and clearness of lines. The imprint is made with a fine quality of **waterproof ink**, which will not blur if touched with wet fingers or when exposed to rain.

CANVAS BOUND BOOKS.

These books are bound in very strong waterproof canvas, which will withstand practically unlimited rough handling. Since the paper is of the same high grade 100% rag stock, with waterproof surface, as described on the opposite page, these books, when exposed to rain and severe weather conditions, give satisfactory service. The quality of the binding and printing is the same as in the leather bound books.

IMITATION LEATHER BOUND BOOKS.

These books are bound in imitation leather of very good quality. The paper, which is made of pure part rag stock, has a waterproofed surface; and will withstand considerable erasing. The quality of the binding and the printing is the same as in the higher grade books.

TABLES.— Tables for Excavations and Embankments, and Curve Tables for Highway and Railroad Engineers, are valuable features which are included in many of the K & E Engineer's Field Books.

The Curve Tables consist of: Minutes in decimals of a degree, Inches in decimals of a foot, Radii, Ordinates and Deflections, Tangents and External angles to a 1° curve, Corrections for table of Tangents and External angles to 1° curve, Table of Deflections for Sub-chords, General Curve Formulas, Tables of Natural Sines and Natural Tangents to every 10 minutes of arc.

The Tables for Excavations and Embankments comprise: Roadway of any width, slope $1\frac{1}{2}:1$.



K & E ENGINEER'S

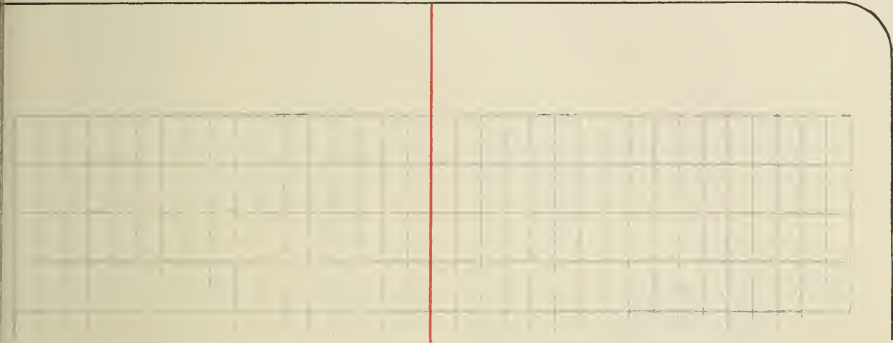
REG. U. S. PAT. OFF.

360. Field Book, Leather Binding, paper 100% rag stock, waterproofed surface, $4\frac{5}{8} \times 7\frac{1}{4}$ in.
361. " " " " " "
- 361S. " " " " " $4\frac{1}{2} \times 7$ in.,
- 360-1. " Canvas " " " $4\frac{5}{8} \times 7\frac{1}{4}$ in.
- 361-1. " " " " " "
- 360A. " Imitation Leather Binding, paper part rag stock, waterproofed surface, "
- 361A. " " " " " "
- 361SA. " " " " " $4\frac{1}{2} \times 7$ in ,

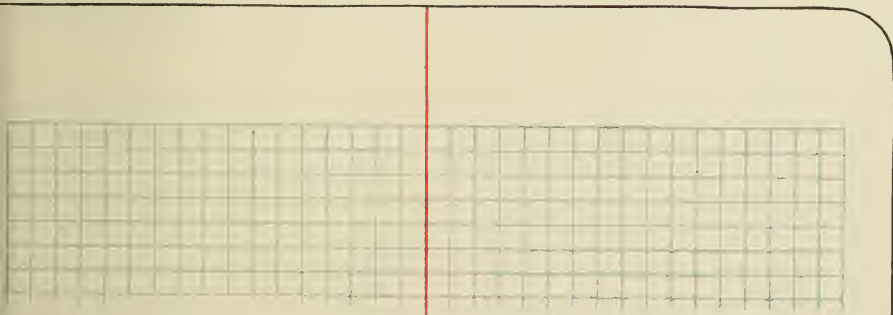
363. Mining Transit Book, Leather Binding, paper 100% rag stock, waterproofed surface, $4\frac{5}{8} \times 7\frac{1}{4}$ in.
- 363-1. " Canvas Binding, " " " "
- 363A. " Imitation Leather Binding, paper part rag stock, waterproofed surface, "



FIELD BOOKS.



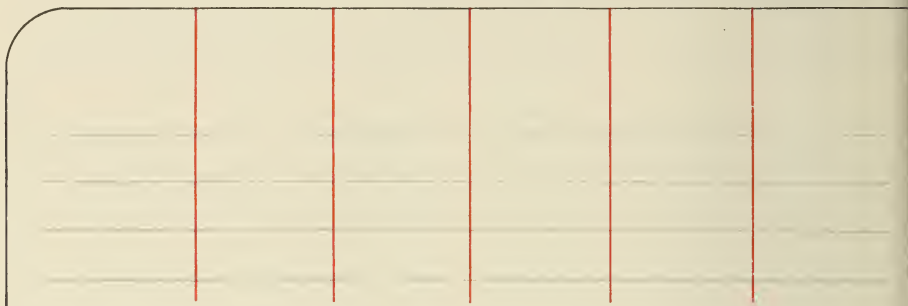
60 leaves, 8 vertical lines per inch, Curve and Embankment Tables, each	doz.
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80 leaves, “ “ “	“
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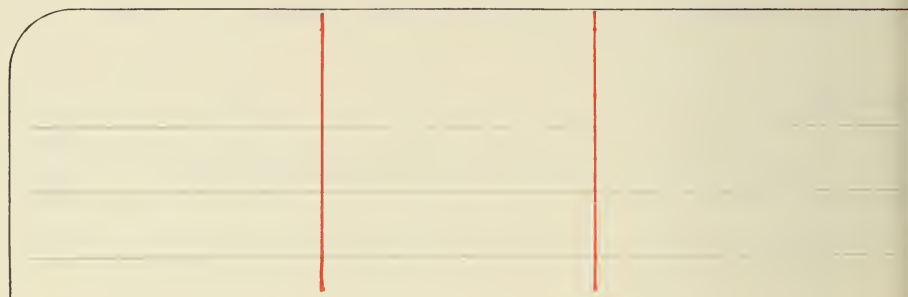
80 leaves, 8×8 to the inch, Embankment Tables and Natural Trig. Functions, . . each	doz.
“ “ “	“
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KEUFFEL & ESSER CO., NEW YORK

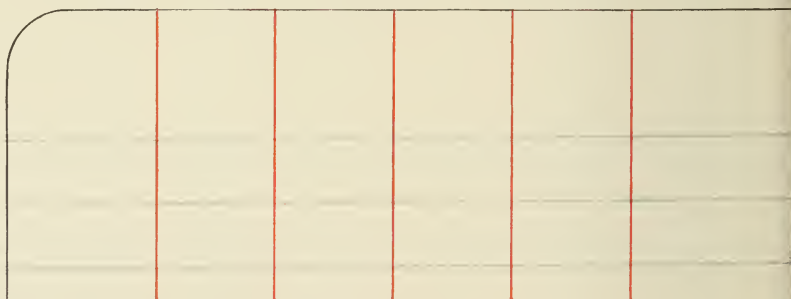
K & E ENGINEER'S
REG. U. S. PAT. OFF.



364. Field Book, Leather Binding, paper 100% rag stock, waterproofed surface, $4\frac{5}{8} \times 7\frac{1}{4}$ in.
 364-1. " Canvas Binding, " " " "
 364A. " Imitation Leather Binding, paper part rag stock, waterproofed surface, "



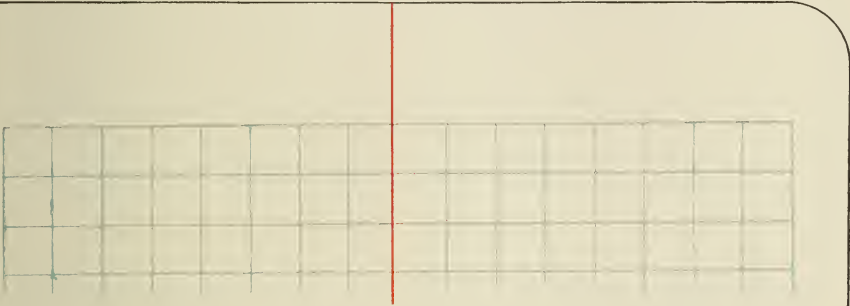
365. Transit Book, Leather Binding, paper 100% rag stock, waterproofed surface, $4\frac{5}{8} \times 7\frac{1}{4}$ in.,



370. Level Book, Leather Binding, paper 100% rag stock, waterproofed surface, $4\frac{1}{8} \times 6\frac{1}{2}$ in.,
 371. " " " "
 370-1. " Canvas Binding, " " "
 370A. " Imitation Leather Binding, paper part rag stock, waterproofed surface "
 371A. " " " "

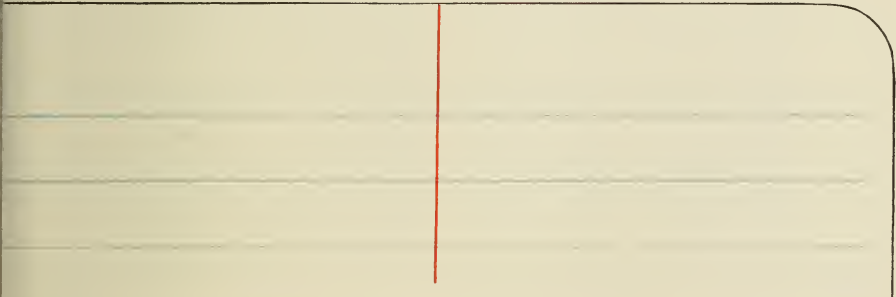


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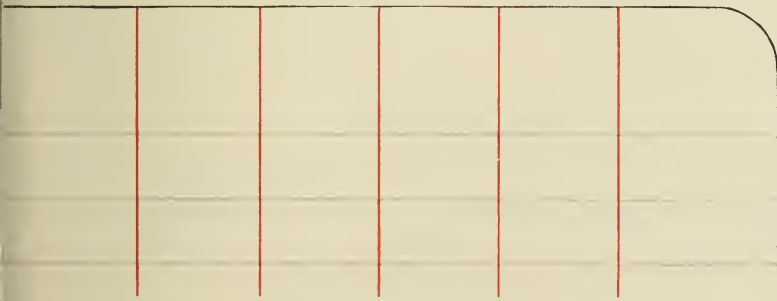


30 leaves, 4×4 to the inch, Curve and Embankment Tables, each doz.

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30 leaves, Curve and Embankment Tables, each doz.



30 leaves, Embankment Tables, each doz.

30 leaves, “
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373. Level Book, Leather Binding, paper 100% rag stock, waterproofed surface, $4\frac{5}{8} \times 7\frac{1}{4}$ in.,
 374. " " " " " "
 373-1. " Canvas Binding, " "
 373A. " Imitation Leather Binding, paper part rag stock " "

375. Cross-section Book, Leather Binding, paper 100% rag stock, waterproofed surface, $5\frac{1}{2} \times 7\frac{1}{2}$ in.
 375S. " " " " "
 376. " " " " "
 375A. " Imitation Leather Binding, paper part rag stock, "
 375SA. " " " "
 376A. " " " "

SECTION.

STA.	ELEV.	GRADE	CUT OR FILL.		
			LEFT	C.	RIGHT

380. Earthworks Book, Leather Binding, paper 100% rag stock, waterproofed surface, $5 \times 7\frac{3}{4}$ in.
 380A. " Imitation Leather Binding, paper part rag stock, " "



FIELD BOOKS.

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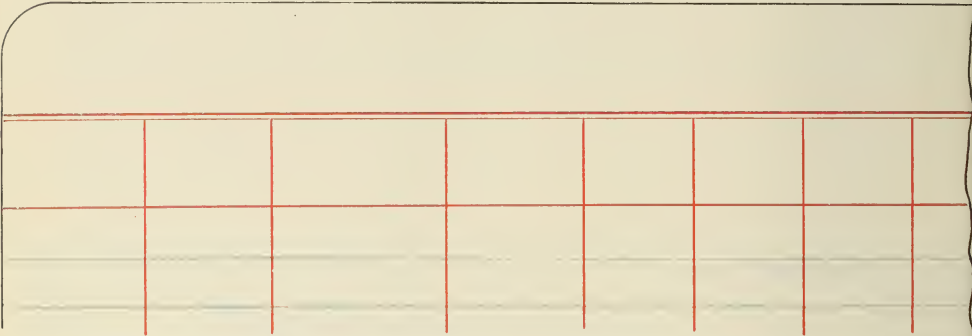
0 leaves,	10×10 to the inch, printed in blue, Embankment Tables,	each	doz.
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AREA'S		Cubic Yds.		Remarks
EXCAVATION	Embankment	Excav.	Embank.	

30 leaves,	Curve and Embankment Tables	each	doz.
“	“		



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385. Topographical Book, Leather Binding, paper 100% rag stock, waterproofed surface

ENGINEER'S DUPLICATING FIELD BOOKS.

GENUINE LEATHER COVERS.

Original, as well as duplicate pages, are numbered from 1 to 30. Original sheets are perforated, and may be placed in loose leaf folders if desired. On the inside of the back cover is a container holding six carbon papers in oil paper sheath. With **Curve and Embankment Tables**.

361D. Field Book, engraving like No. 361 but with carbon paper
and duplicate sheet, each per doz.

363D. do. do. like No. 363 do. " "

LOOSE LEAVES

Loose leaves are furnished in sets of 50 leaves, which is about the carrying capacity of binders Nos. 389 and 390 (Page No. 91) These leaves are not machine ruled, but printed from an engraving like K & E Field Books; and the ink is waterproof. The paper is made of pure 100% rag stock and has a waterproofed surface with excellent erasing qualities.

The following Loose Leaves fit Binders Nos. 389 and N391:

361 L. Field Book	ruulings like No. 361 (Page 84)	set of 50 leaves
363 L. Mining Transit Book	ruulings like No. 363 (Page 84)	"
374 L. Level Book	ruulings " " 374 (Page 88)	"
375 SL. Cross Section Book	ruulings " " 375 (Page 88)	"

The following Loose Leaves fit Binders Nos. 390 and N392

361 ½ L. Field Book	ruulings like No. 361 (Page 84)	"
363 ½ L. Mining Transit Book	ruulings like No. 363 (Page 84)	"
371 L. Level Book	ruulings like No. 371 (Page 86)	"

No. _____ NAME _____

YEAR _____ MONTH _____

	DATE	DESCRIPTION OF WORK	HOURS	
MONDAY				
TUESDAY				
WEDNESDAY				
THURSDAY				
FRIDAY				
SATURDAY				

ATLANTIC TIME RECORDS Published by KETVEL & SMITH CO., NEW YORK

CRESCENT CERTIFICATE BOOK.
TRADE MARK

No. _____	_____ 19__
Date _____	
City _____	
State _____	
Contract No. _____	
Amount _____	
Am's Certificate, \$ _____	_____
Preliminary Paid, \$ _____	_____
Total to Date, \$ _____	_____
Am's Contract, \$ _____	_____
Extra Work, \$ _____	_____

397-1. Crescent Certificate Book, size of sheet $3\frac{1}{8} \times 9$ in., 100 sheets
in linen cover, with imprint of customer's name;
. in lots of 2, each

397-2. do. without imprint. each

Nos. 397-1 and 397-2 are old Nos. 341-I and 341-II



MONARCH CERTIFICATE BOOK.

TRADE MARK

<p>Certificate No. _____ 19</p> <p>Number of Payment _____</p> <p>Owner _____</p> <p>Building _____</p> <p>Cert. given to _____</p> <p>Contractor for _____</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Amount of Contract, \$</td> <td style="width: 50%; border-bottom: 1px solid black;"></td> </tr> <tr> <td>Additions, \$</td> <td style="border-bottom: 1px solid black;"></td> </tr> <tr> <td>Total, \$</td> <td style="border-bottom: 1px solid black;"></td> </tr> <tr> <td>Deductions, \$</td> <td style="border-bottom: 1px solid black;"></td> </tr> <tr> <td>Total, \$</td> <td style="border-bottom: 1px solid black;"></td> </tr> <tr> <td>Am't of this Cert. \$</td> <td style="border-bottom: 1px solid black;"></td> </tr> <tr> <td>Previously Paid, \$</td> <td style="border-bottom: 1px solid black;"></td> </tr> <tr> <td>Total paid to date, \$</td> <td style="border-bottom: 1px solid black;"></td> </tr> <tr> <td>Balance, \$</td> <td style="border-bottom: 1px solid black;"></td> </tr> </table>	Amount of Contract, \$		Additions, \$		Total, \$		Deductions, \$		Total, \$		Am't of this Cert. \$		Previously Paid, \$		Total paid to date, \$		Balance, \$		<p>Certificate No. _____ 19</p> <p>To _____</p> <p>This is to Certify That under the terms of the contract dated _____ for work upon _____</p> <p>M _____</p> <p>Contractor for _____ entitled to the _____ Dollars,</p> <p>payment amounting to _____</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Amount of Contract, \$</td> <td style="width: 50%; border-bottom: 1px solid black;"></td> </tr> <tr> <td>Additions, \$</td> <td style="border-bottom: 1px solid black;"></td> </tr> <tr> <td>Total, \$</td> <td style="border-bottom: 1px solid black;"></td> </tr> <tr> <td>Deductions, \$</td> <td style="border-bottom: 1px solid black;"></td> </tr> <tr> <td>Total, \$</td> <td style="border-bottom: 1px solid black;"></td> </tr> <tr> <td>Am't of this Cert. \$</td> <td style="border-bottom: 1px solid black;"></td> </tr> <tr> <td>Previously Paid, \$</td> <td style="border-bottom: 1px solid black;"></td> </tr> <tr> <td>Total paid to date, \$</td> <td style="border-bottom: 1px solid black;"></td> </tr> <tr> <td>Balance, \$</td> <td style="border-bottom: 1px solid black;"></td> </tr> </table> <p>\$ _____ 19</p> <p>Received from _____</p> <p>as per above Certificate. _____ Dollars.</p>	Amount of Contract, \$		Additions, \$		Total, \$		Deductions, \$		Total, \$		Am't of this Cert. \$		Previously Paid, \$		Total paid to date, \$		Balance, \$	
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"Monarch" Certificates Published by KEUFFEL & ESSER CO., N. Y.
 "Monarch" Certificates Published by KEUFFEL & ESSER CO., NEW YORK

398-1. Monarch Certificate Book, size of sheet $6\frac{1}{8} \times 11\frac{3}{4}$ in., 100 sheets in
linen cover, with imprint of customer's name, in lots of 2, each

398-2. Monarch Certificate Book, similar to 398-1, but without imprint, " "
Nos. 398-1 and 398-2 are old Nos. 341-I and 341.

STANDARD DOCUMENTS

OF THE AMERICAN INSTITUTE OF ARCHITECTS.

- 399 A.** Agreement and General Conditions, in cover, each
 - 399 B.** Bond of Suretyship "
 - 399 C.** Form of Sub-contract "
 - 399 D.** Letter of Acceptance of Sub-contractor's Proposal "
 - 399 E.** Standard form of Agreement between Owner
and Architect on the percentage Basis "
 - 399 S.** Complete Set "
- Nos. 399A-S are old Nos. 349 A-S.



K & E
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DRAWING INSTRUMENTS.

The drawing instruments listed in this catalogue are of two types—the **Square** or **Paragon** type, and the **Flat** or **Pharos** type. Of each type three separate lines are listed in the order of their quality, as follows:

Square	Page Nos.	Flat	Page Nos.
Paragon	96 to 135	Pharos	137 to 146
Key	147 to 153	Special Arrow	169 to 176
Anvil	154 to 168	Arrow	177 to 183

The Square type is superior in design and construction; the only advantage of the Flat type being its relative low cost, due to the fact that it lends itself readily to machine production. The very best instruments that can be made of the Flat type are not comparable to **PARAGON**, which represent design, quality, accuracy and ease of manipulation in their highest state of perfection.

SCHOOL QUALITY DRAWING INSTRUMENTS

In addition to the drawing instruments listed in this catalogue we carry also a complete line of School Quality Drawing Instruments, which are suitable to the needs of students of Preparatory Schools, High Schools and Manual Training Schools. Our Catalogue of School Quality Drawing Instruments will be sent free upon request.



K & E

DRAWING INSTRUMENTS

PARAGON

ACUFFEL & ESSER CO.

KEUFFEL & ESSER CO., NEW YORK

K & E

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

The quality of drawing instruments, which frequently becomes evident only after they have been put to actual use, cannot be determined from mere inspection of the goods, except by experts; so that the purchaser is seldom able to tell just what quality of instruments is presented for his approval. This is especially true when the general appearance of a good instrument has been closely imitated by an inferior one. Hence, the assertions of those who supply the instruments must be supported by an established reputation.

Our intimate practical and theoretical knowledge of drawing instruments, extending over a period of nearly seventy years, and based not only upon a close study of the requirements of the American draftsman, but upon long experience in the manufacture of drawing instruments, furnishes a sufficient guarantee that our statements as to the respective qualities of the instruments hereafter described can be absolutely relied upon.

The various lines described in this catalogue cover every demand for instruments suitable to all uses, from the very best to those of the lowest price at which instruments for professional use can be offered. Hence, since we meet every demand, we have no object in misrepresenting any particular style or grade of instruments. All are described accurately, in order that it may be apparent to the prospective purchaser which grade of instrument is best adapted to his particular requirements.

It cannot be too strongly emphasized, however, that for the professional and prospective professional draftsman, it is advisable and, in the end, more economical, to buy the best instruments that he can afford. **Good instruments will meet all requirements**, and the saving in time and the satisfaction resulting from their use, the better work which can be done with them, and their permanence, amply justify the paying of higher prices. Instruments which prove unfit for the purpose for which they were intended, are worthless to the purchaser, who will be obliged to replace them with better ones. **The most expensive instruments in first cost are the cheapest in ultimate cost.**

MATERIALS

The metals most commonly employed in drawing instruments are nickel silver and steel; stainless steel, resistant to rust and other corrosive action, being used in the construction of a majority of the **K & E Paragon Drawing Instruments**. While it is evident that steel must be of good quality and properly tempered, the requisite properties of nickel silver are less commonly recognized.

Formerly, the cheaper grades of drawing instruments were constructed of cast nickel-silver, but to-day the general use of machine tools has made the use of rolled (sheet or plate) nickel-silver the rule for practically all grades. The process of rolling, however, does not insure a high quality of nickel-silver, since quality depends not only upon the proportions of the metals in the alloy, but also upon the density and hardness resulting from the cold-rolling of the metal. The amount of compression produced by the rolling has a great influence upon quality—the metal for the higher grades being worked over considerably more than that for the cheaper grades. Hence, with the better quality instruments, greater strength and rigidity is obtained with the same volume of metal.

DIMENSIONS

The length of the instruments, as given in this catalogue, is "overall," including the handle. Such lengths are subject to slight variations.



PARAGON

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DRAWING INSTRUMENTS.

Paragon Drawing Instruments, because of their super quality, stand in a class by themselves. They are hand fitted and finished by artisans who attain the requisite technical proficiency only after a long apprenticeship and years of special training. Instruments of the fit and finish of these cannot be produced by machinery alone.

Paragon instruments are specimens of the craftsman's art at the best, produced by artisans who have the real "craftsman's pride in his work." They are superb in their material, fitting, balance, precision and beauty of line and finish. **They are a delight to both the hand and the eye.** They permit the draftsman to transfer to cloth or paper the very best work of which he is capable at the least expenditure of time and trouble. As their name indicates, they are models of excellence. No one who has ever used **Paragon** instruments will be satisfied with any others.

Attention is directed to the following special features of **Paragon** instruments.

PARAGON FINISH

REG. U. S. PAT. OFF.

The finish of **Paragon** instruments may be termed "mathematical instrument finish." Since it is designed to bring out perfection of workmanship and form, and to insure their permanence, it would, incidentally, bring out any flaw or fault, did any exist. Mathematical instrument finish should not be confused with that resulting from buffing, sometimes used on instruments of so-called high quality. Buffing, in producing a glossy surface, partly effaces angles and edges, and frequently serves to obscure flaws and imperfections resulting from a cheapened cost of production.

PARAGON MATERIALS

REG. U. S. PAT. OFF.

The nickel silver employed in the manufacture of **Paragon** instruments contains a very high percentage of nickel, and has been rolled and re-rolled to obtain the greatest of strength and rigidity, and resistance to wear.

Three kinds of special high quality steel are employed—a high carbon steel, a stainless steel, and a highspeed steel; all conforming to rigid specifications. The care taken in tempering these materials to the requirements of drawing instrument practice, assures a lifetime of highly satisfactory service to the parts made of them. The stainless steel is especially desirable, since it is unaffected by ink, moisture from the fingers, or other commonly encountered corrosives.

Please note that in the listing of instruments which follows this descriptive section, high speed and stainless steel where used, are clearly designated. Where the kind of steel is not mentioned, it may be assumed that the parts are of high carbon steel.

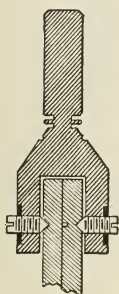
PARAGON COMPASSES AND DIVIDERS.

REG. U. S. PAT. OFF.

The Head. The head of the compasses and dividers forms the joint between the legs. The aim in designing the head is to obtain sufficient friction between the heads of the two legs so that the brace or fork which holds them together may be rotated without disturbing their setting. Since the brace or fork must also have sufficient friction to keep it in any position in which it may be set, the problem resolves itself into joining three parts, two of which must have considerably more friction between their surfaces than that between them and the third part. This problem has been solved by means of the pivot joint.



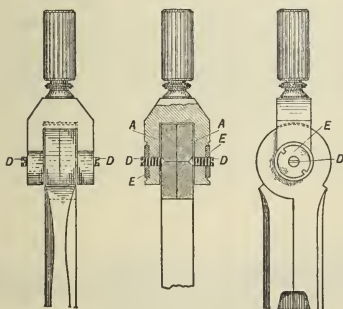
Ordinary
Pivot Joint



Paragon
Pivot Joint

The pivot joint is constructed as follows: The head of each leg is shaped like a disk. The two disks are held in contact in a brace or fork by means of two pivot screws, whose points are hardened steel cones, and which fit into conical depressions in the heads of the two compass legs. Hence, the friction between the two comparatively large surfaces of the disks is considerably greater than that of the two conical points of the pivots with the disks. However, the rotation between the brace or fork and the legs has a tendency to unscrew one or the other of the pivot screws, which makes it essential that some locking device be employed to keep the pivots from unscrewing.

In the ordinary pivot joint the pivot screws are locked by means of two slender set screws passing through the free ends of the brace and bearing against the threads of the pivots.



holding the bearing surfaces (AA) firmly in contact. The pivot screws themselves, however, exert so little friction that the compasses head may be moved freely without disturbing the setting of the legs in the least.

Blued lock nuts, (EE) set in a recess in the compasses head, hold the pivot screws in adjustment (Esser's pivot joint). This arrangement eliminates the usual outside lock screw, and the attendant danger of damaging the pivot screw threads. Needless to say, the appearance of the instrument is greatly enhanced.

While pivot screw lock nuts are used on some of our lower quality instruments, all of the features of the original Esser's patented pivot joint, combined with the most expert workmanship, will be found only in Paragon instruments.

Perfect design and painstaking workmanship are responsible for the smooth, even operation of Paragon compasses heads. The bearing surface (AA) consists of two planes of dissimilar metals: one a smooth steel plate with an oil retaining groove, the other a raised ring of nickel silver. These parts are so carefully fitted by skilled instrument makers, that no variations in friction are perceptible as the compasses are opened and closed.

The pivot screws (DD) are made of hardened steel. Their conical points fit snugly into depressions in the leg heads,



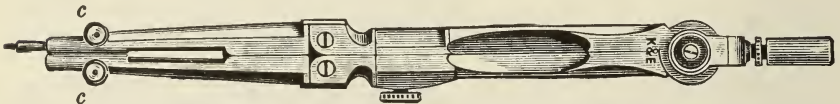
PARAGON COMPASSES AND DIVIDERS.
REG. U. S. PAT. OFF.

Insertion Pieces. Another important feature in the compasses is the manner of inserting the several points (parts) belonging to them. Here, as is frequently the case, most makers recommend that which costs least and is easiest to make. In the following illustration is shown the pattern for the shank of insertion pieces which are applied to **Paragon** instruments; the long and strong pentagonal shank



Pentagonal Shank with Set Screw.

The pentagonal shank engages in a socket of the same shape and size. It is held in place by a screw which presses the wedge into the corresponding groove in the socket. This insures perfect alignment of the instrument even after many years of wear.



Compasses, with pencil point with pentagonal shank inserted.

Needle and Pencil Points. The needle and pencil points of **Paragon** compasses are adjustable — that is, means are provided for permitting the needle and pencil points to be brought into correct relationship. The usual design requires screws (c) (see cut above) to clamp the needle and pencil point sockets tightly about the points.

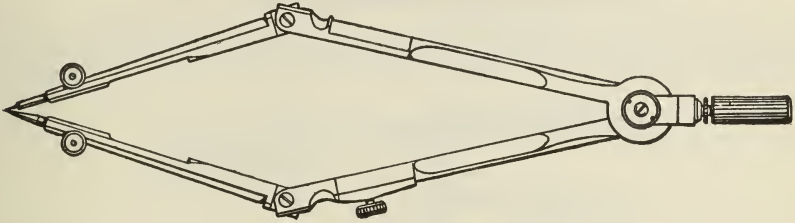
A more recent (patented) device is shown in the illustration below:



No. 610 RXA.

Compasses, with patent adjustment for the needle and pencil points.

The needle and pencil points are adjustable for length by rotating the collars (a) which, in turn, can be locked in position by means of the nuts (b). Since the needle and pencil point are moved inward and outward when the collars (a) are rotated, the device forms, in effect, a micrometer adjustment, by which the correct relationship between the points can be established with great expedition and efficiency.



Compasses in position for testing alignment.

Joints. All joints in compasses and their parts should move in the same plane. This is readily tested by inserting the several parts and then folding the compasses as shown in the above cut. If the joints are perfect, and the shanks properly aligned in the sockets, the extreme points of the instrument will meet. Every good instrument should meet the requirements of this test.

The knee joints of our **Paragon** instruments are provided with accurately fitted steel plates, which insure the greatest smoothness and ease in operation with the minimum of friction and wear. Hence, these joints so seldom get out of order that the occurrence, even after many years of use, is generally due to an accident. Should such an accident occur the instrument should be sent to us for readjustment.



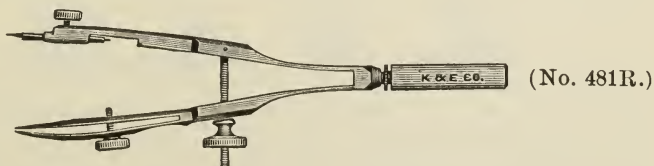
Compasses with hairspring, showing fixed needle point and pen (No. 604 H)

Hairsprings. Some draftsmen prefer to make minute adjustments of the compasses and dividers by means of the hairspring. The addition of a hairspring to any instrument of this type necessitates the highest quality in design and workmanship in order to render it precise, effective and durable. The hairspring construction in **Paragon** instruments is guaranteed to be unsurpassed in precision, effectiveness and durability.

PARAGON SPRING BOWS.

REG. U. S. PAT. OFF.

Bows, except for the handles, screw-heads and nut, are made entirely of steel, in the symmetrical forms illustrated below



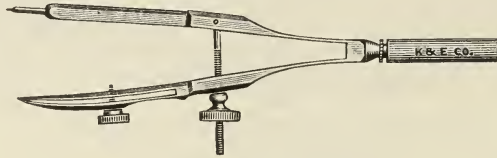
The usual method of setting the needle in correct relation to the pen or pencil point consists in releasing a clamp screw, positioning the needle point, and tightening the clamp screw. This adjustment has to be made whenever

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PARAGON SPRING BOWS.

REG. U. S. PAT. OFF.

the distance between the needle and pen or pencil point is materially altered. A more recent (patented) method is indicated by the following illustration.



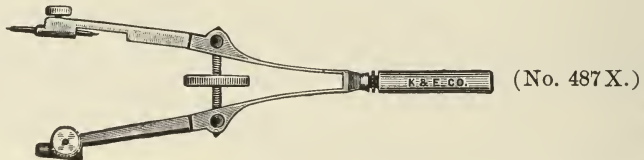
No. 481 FX.

Bow Instrument, with cushion spring needle point.

The needle point of the bow pen and bow pencil, instead of being provided with a clamp screw for adjusting purposes, is fitted with a cushion spring arrangement, of patented construction, inside the leg, by which the needle point can be adjusted to the pen or pencil point through a slight pressure maintained on the handle of the instrument. This method is much handier than the usual clamp screw method of adjustment, since the correct relation between the points is established instantaneously for any radius. This is especially handy where very small circles are to be drawn.

The life of a bow may be prolonged indefinitely by compressing the spring with the fingers while setting the thumbnut. The latter should be used as the compressing agent only for the ultimate final adjustment of the points to the desired radius. This method insures minimum wear of the threads.

Where a bow instrument has considerable use, the central thumbscrew proves to be a great convenience.



(No. 487 X.)

The illustration indicates the general arrangement of the central thumbscrew, in which two threads, a right and a left, engaging in swiveling sockets, are moved by the one nut.

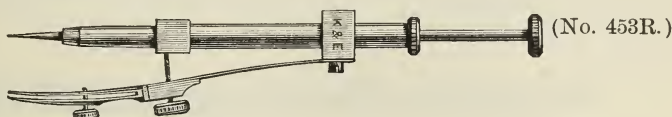
The chief difference between a single thread and a right and left thread (central thumbscrew) bow lies in the fact that the stiffness of the spring bow, in which the two threads are employed, is not dependent upon the strength of the spring. Both legs of the bow are held rigidly by the screw; and the counter pressure of the spring is of minor importance. Moreover, since the two threads work simultaneously, both legs move at the same time, and the setting of the points is completed with only one-half the number of turns required with the single thread arrangement. The size and location of the central thumbscrew add greatly to the convenience of operation, since, with practice, the draftsman learns to adjust it while in place upon the drawing by rotating the nut with the forefinger of the hand which holds the instrument. (Nos. 485X to 486 K, page 118).



PARAGON DROP SPRING BOW INSTRUMENTS.

REG. U. S. PAT. OFF.

Another useful instrument especially adapted to drawing very small circles or arcs, is shown below:



In this instrument the center pin is held stationary, and the pen (or pencil) revolves about it. The former may be set upon the desired center point, and the pen (or pencil) then allowed to slip down to a bearing upon the drawing. When the arc or circle is completed the pen (or pencil) may be removed from contact with the drawing before the entire instrument is lifted clear.

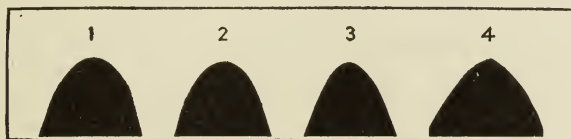
This construction has the advantages that, since the center pin does not revolve, it will not wear an unsightly hole in the drawing; while the drop arrangement allows careful setting, insures uniform lines by means of its own natural pressure upon the drawing, and reduces to a minimum the danger of smearing. Hence, the instrument is the best spring bow for drawing circles or arcs of very small radii.

PARAGON DRAWING OR RULING PENS.

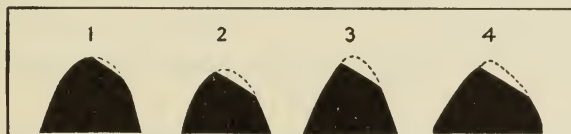
REG. U. S. PAT. OFF.

Since the drawing pen is that instrument of a draftsman's outfit which is in constant use, defects in quality or construction soon make themselves felt.

Especial attention is called to **Paragon WYTETIP "R" Drawing Pens**, in which the points are of Highspeed steel, butt-welded to Stainless steel blades. The life of these Highspeed steel points, without resharpening, is four to five times longer than the best carbon steel points heretofore employed. This is demonstrated by the microphotographs of the drawing edges of four ruling pens shown below; each of the pens having been given exactly the same test by being run dry under uniform pressure on a hard surface paper in an apparatus especially designed for the purpose. The numbers above the microphotographs signify: 1—**K & E Paragon WYTETIP "R" Drawing Pen**; 2—one of the best Carbon steel drawing pens; 3—a good Carbon steel drawing pen; 4—a fair quality steel drawing pen.



Original Form



After 5000 Feet of Ruling

The Stainless Steel blades, which would not themselves hold a satisfactory drawing edge, have the resiliency required of drawing pen blades, and, in addition, are unaffected by ink, moisture from the fingers, or other commonly encountered corrosives.

Paragon WYTETIP "R" Drawing Pens are covered by U. S. Patent No. 1,886,258.

KEUFFEL & ESSER CO., NEW YORK

PARAGON DRAWING OR RULING PENS.

REG. U. S. PAT. OFF.

Joints. Drawing pens are generally of one of two types:

- (a) With a joint; which allows the blades to be thrown apart for cleaning.
- (b) Without a joint.



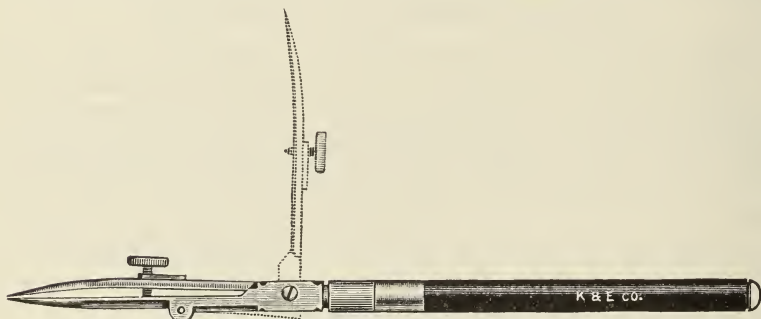
Pen with joint. (No. 527).

In pens with joints it is necessary that the joint should be very carefully made; otherwise the upper blade becomes shaky and the pen, as a result, useless.

PARAGON KNIFE SPRING PEN.

REG. U. S. PAT. OFF.

A variation of the joint type of pen is illustrated below in our



Knife Spring Paragon WYTETIP "R" Drawing Pen. (No. 524 KR).

Knife Spring Paragon WYTETIP "R" Pens. The Knife Spring Paragon WYTETIP "R" Pens have a hinged upper blade actuated by a spring similar to that of a pocket knife, which either holds the pen open at 90 degrees or presses it firmly against the fixed blade. This construction requires the best of design and workmanship, as well as the highest quality of material. The points are of Highspeed steel, and the blades of Stainless steel, as described on page 101.

Opening the pen for cleaning does not change the adjustment for width of line. (Nos. 522 KR to 524 KR, page 122).



Pen without joint, but with spring blade. (No. 524R).

Pens without a joint, but in which the upper blade is made to spring open (spring blade), possess many of the advantages of a pen with a good joint.



PARAGON DETAIL DRAWING PEN.
REG. U. S. PAT. OFF.

This pen has a spring blade like that of No. 524R, shown on page 102. The blades in this particular type of pen are made wide in order that a sufficient quantity of ink may be held to admit of drawing long and heavy lines without the necessity of the frequent re-fillings which the ordinary drawing pen would require under the same circumstances, (Nos. 538-1-2R-3).



Detail Drawing Pen (No. 538-2R.)

PARAGON HATCHING PENS.
REG. U. S. PAT. OFF.



Drawing Pen with push screw. (No. 531.)

Pens for close ruling (hatching pens), since they must be very firm, are made without joints. In these pens the spring of the blades holds their points together. The latter are forced apart in one of two ways.

- (a) A thumbscrew threaded through the upper blade pushes directly against the lower blade.
- (b) A wedge between the blades separates or releases them, according to whether it is moved from or toward the handle by a threaded rod actuated by a thumbnut set at the upper end of the handle.

The wedge type is preferred by some, since the absence of the thumbscrew on the blade gives a better sight of the point of the pen. This is sometimes an advantage in crowded drawings.



Drawing Pen without thumbscrew. (No. 532 X).



PARAGON BORDER PENS.

REG. U. S. PAT. OFF.



(No. 536).
Border Pen.

The border pen is intended to rule heavy parallel lines as in forming the border of a drawing. Hence, its blades have a greater capacity for holding ink than those of the railroad pen. It is also somewhat differently constructed from the railroad pen, since in the latter the upper blades are provided with springs, whereas in the border pen it is the lower blades which spring. Hence, the set screws are threaded in the upper blade only, their free ends pressing against the lower blades. The blades are turned in opposite directions. This pen may be employed for the same purposes as a railroad pen; and the railroad pen described on page 125, may also be employed for the purpose of ruling parallel border lines of moderate thickness.



(No. 535).
Border Pen, for broad lines.

For ruling broad heavy lines up to $\frac{3}{8}$ of an inch thick, the pen illustrated above is often serviceable. A screw with right and left thread is fixed in the middle blade. Two large nuts upon this thread restrain the tendency of the outer blades to spring apart, and permit the quick and accurate adjustment of the nibs to the proper setting.

PARAGON DOTTING PEN.

REG. U. S. PAT. OFF.

In order to facilitate the work of drawing dotted lines, a good dotting pen is desirable. It must be carefully designed and constructed so that the ink will be supplied to the dotting mechanism as required. Otherwise the drawing will be blurred. Such a pen is shown in the following illustration.



(No. 551).
Dotting Pen.

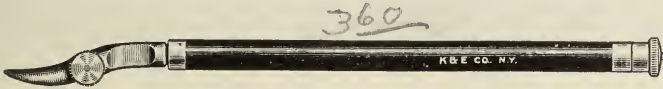
The inner surface of the under blade is surrounded with a thin metal edging, thus forming a reservoir for the ink. The blades can be brought together by the thumbscrew, thus closing the reservoir on all sides, except a narrow space at the bottom, through which the ink flows to the dotting wheel. No more than the requisite quantity of ink is supplied, which prevents blotting. This pen has six wheels, each producing a different pattern of broken line. When not in use these wheels are housed between the upper parts of the blades.

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PARAGON CURVE PENS.

REG. U. S. PAT. OFF.

The pen for drawing single curved lines has a hollow handle in which a thin rod rotates.



(No. 533R).

Improved Curve Pen.

Since the blades are fastened to the end of this rod and are eccentric to it, they turn easily and follow the sharpest curve with precision. A pen of this kind enables the draftsman to trace curves with the least fatigue, since the hand may always be kept in a natural position. When required, this instrument may be quickly converted to the uses of a common ruling pen by tightening the small nut at the upper end of the rod. This clamps the handle.

PARAGON ROAD INSTRUMENTS.

REG. U. S. PAT. OFF.

A variation of the above pen is shown in the following illustration.

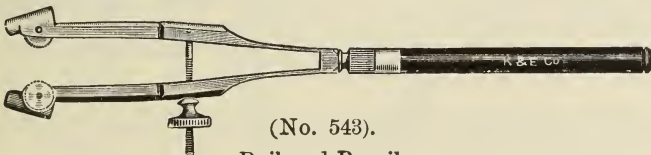


(No. 546).

Improved Railroad Curve Pen.

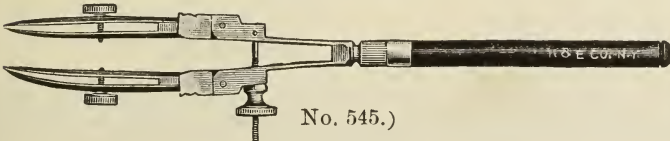
In this, two pens, attached to the rod, may be set at various distances apart. This arrangement makes the pen eminently suitable for drawing, at one operation, lines representing the two rails of a railroad track, the boundaries of a road or similar delineations.

Where it is desired to draw two parallel straight or moderately curved lines, at a minimum of time and labor, the railroad pen and pencil shown below are of great service.



(No. 543).

Railroad Pencil.



No. 545.)

Railroad Pen.

These instruments have long handles like the common ruling pen, whereas the two legs are joined by a spring-bow arrangement, which admits of the accurate adjustment of the two to any predetermined distance apart. Both pens have knee-joints, by means of which both may always be set perpendicular to the drawing. Likewise, both pens are turned in the same direction, so that lines can be drawn against a straightedge as readily as with a common ruling pen.

KEUFFEL & ESSER CO. NEW YORK

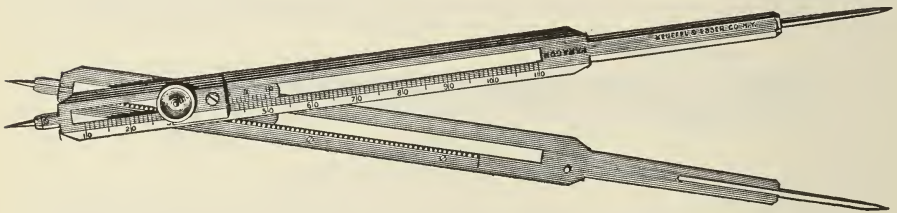
PARAGON PROPORTIONAL DIVIDERS.

REG. U. S. PAT. OFF.

These instruments provide a simple and accurate means of copying drawings to a reduced or to an enlarged scale. They not only enable the draftsman to reproduce the *lines* of a drawing to any desired ratio, but the drawing may also be so reproduced that the *areas* of any given plane surface, or the *contents* of any solid shall likewise be proportionate to those of the original.

Proportional Dividers consist of two legs, 6 to 9 inches long, with fine steel points at their opposite extremities. These legs turn on a movable pivot, the position of which may be so adjusted that the ratio of the distance between one pair of points to the distance between the other pair of points may be varied.

These adjustments are facilitated by means of a series of graduations or scales on the legs, any one of which may be made to coincide with a line traced across the slider attached to the pivot and running in a longitudinal groove in the legs. In No. 440X a vernier is attached to the slider, and this allows a very fine setting of the pivot.



No. 440X.

Paragon Proportional Dividers are of various types. No. 435 is divided for lines and circles; No. 439X for lines, circles, planes and solids; while No. 440X, besides having a vernier adjustment, is so completely graduated that, in addition to the regular proportions given by No. 439X, many special ratios, such as diameter of a circle to the side of an equal square, feet to meters, yards to meters, etc., may be rapidly laid off.

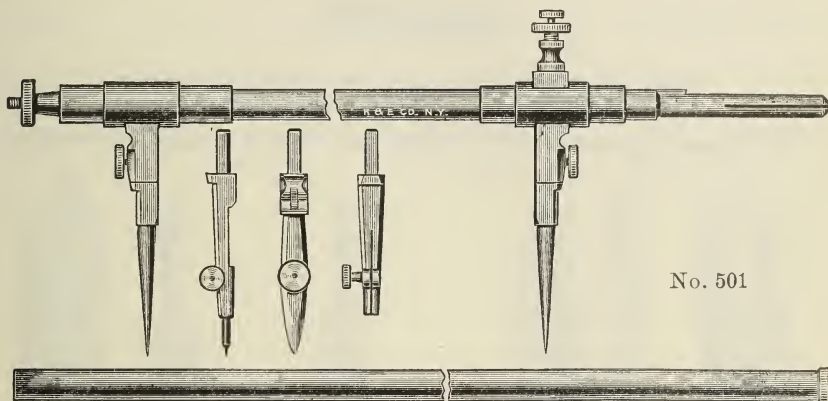
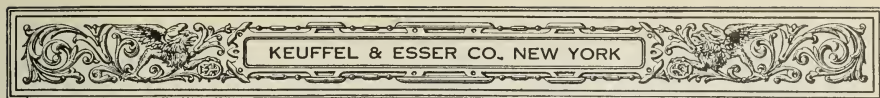
All of these instruments are provided with removable points, so that those parts which are most likely to wear or become broken can be replaced.

PARAGON BEAM COMPASSES.

REG. U. S. PAT. OFF.

When it is required to measure or transfer considerable distances on a plan or drawing, or to describe arcs having long radii, recourse must be had to Beam Compasses. Hence, these serve as both compasses and dividers.

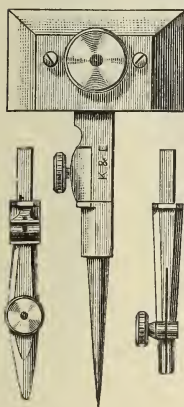
The Beam Compasses consist, in the main, of three distinct parts: (1) a box or sleeve of nickel silver, provided with means for clamping it to a bar or tube, which carries the pen or pencil and a micrometer for making the ultimate fine adjustment of the drawing point to the desired length or radius. (2) a box or sleeve of nickel-silver, provided with a clamp, which carries the fixed or center point, and slides freely along a bar or tube; and (3) a tube of nickel-silver, or a bar of wood, to which the boxes or sleeves are attached.



No. 501

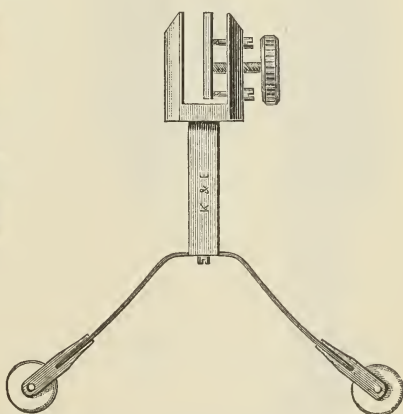
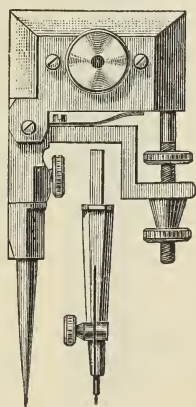
Tubular Beam Compasses.

The above illustration shows the tubular beam compasses, with the bar in two sections. The micrometer screw is shown at the left end of the upper bar. Similar beam compasses, with the bar in three sections, and a total reach of 38 inches, are regularly furnished.



No. 510X.

Beam Compasses for use with straightedge or wooden bar.



No. 511.

Wheel attachment for beam compasses

The left-hand illustration above shows beam compasses, which may be used in connection with a straightedge or wooden bar. The micrometer adjustment on this is somewhat different from that on similar instruments, previously described, since the turning of the screw tilts the drawing point one way or the other to the desired setting.

Work with the beam compasses may be considerably facilitated through the use of the wheel attachment shown above. This not only steadies the entire instrument, but insures the smooth and even travel of the drawing point over the drawing surface.

PARAGON CASES.

REG. U. S. PAT. OFF.

The Pocket Cases for **Paragon** Drawing Instruments are made of an exceptionally high quality heavy leather; and are lined with green silk velvet.



PARAGON

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



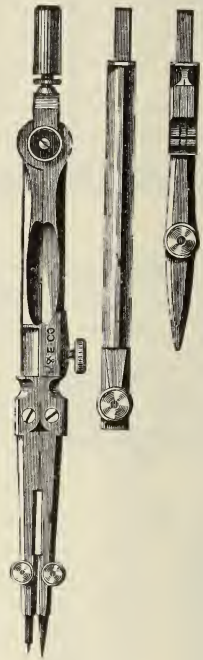
603 H.



604 H.



605 H.



605 $\frac{1}{2}$.

603 H. Compasses, $4\frac{1}{4}$ in., with Hairspring, and with fixed Needle Point, Pen and Pencil Point, . . each

604 H. Compasses, $4\frac{1}{4}$ in., with Hairspring, and with fixed Needle and Pen Point, "

605 H. Compasses, $4\frac{1}{4}$ in., with Hairspring, and with fixed Needle and Pencil Point, "

605 $\frac{1}{2}$. Compasses, 5 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar . . . "

KEUFFEL & ESSER CO., NEW YORK

PARAGON

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DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 608 X.



614.



610 RX.

- 606 X. Plain Dividers, $5\frac{3}{4}$ in., steel parts of stainless steel each
 - 608 X. Hairspring Dividers, $5\frac{3}{4}$ in. " " " " "
 - 610 RX. Compasses, $6\frac{1}{4}$ in., with fixed Needle Point, Paragon "R" Pen, Pencil
Point and Lengthening Bar, steel parts of stainless
steel "
 - 614. Lead Box, fine nickel silver, screw cap, containing 6 leads "
- No. 614 is old No. 559.

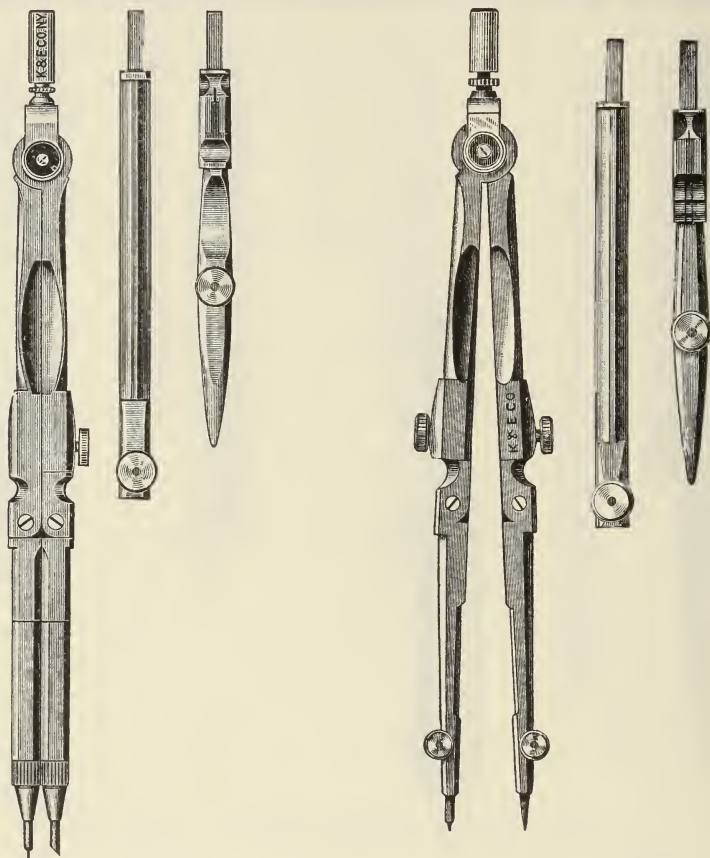


PARAGON

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 610 RXA.

No. 610 HRX.

610RXA. Compasses, $6\frac{1}{4}$ in., similar to No. 610 RX, but with patent adjusting device for the needle and pencil points. each

On No. 610RXA the needle and pencil points are adjustable to length by rotating the collars which, in turn, can be locked in position by means of nuts. This design forms a quick and efficient method for bringing the needle and lead into correct relationship. (See page 98.)

610HRX. Compasses, $6\frac{1}{4}$ in. like No. 610RX, but with Hairspring . . . each

610KRX. Compasses, $6\frac{1}{4}$ " with fixed Needle point, Knife Spring Paragon "R" Pen Point, Pencil Point and Lengthening Bar; steel parts of stainless steel . . . each

The Knife Spring Paragon Pens have a hinged upper blade actuated by a spring similar to a pocket knife, which either holds the pen open at 90 degrees or presses it firmly against the fixed blade. (See page 102.) Opening the pen for cleaning does not change the adjustment for width of line. For illustration of Knife Spring Pen, see page 122.

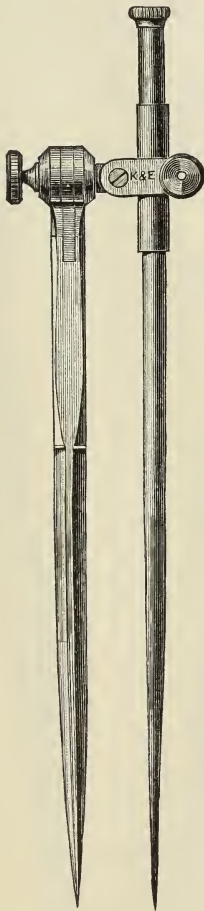
KEUFFEL & ESSER CO., NEW YORK

PARAGON

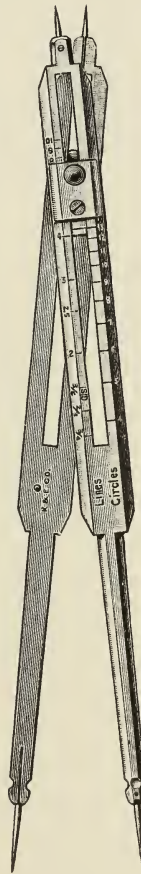
REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 431.



435.

431. Three-legged Dividers, one leg adjustable for length, 6 in., each
Morocco Case, silk velvet lined for No. 431 “

435. Proportional Dividers, finely divided for lines and circles,
 $7\frac{3}{4}$ in., “

Morocco Case, silk velvet lined for No. 435 “

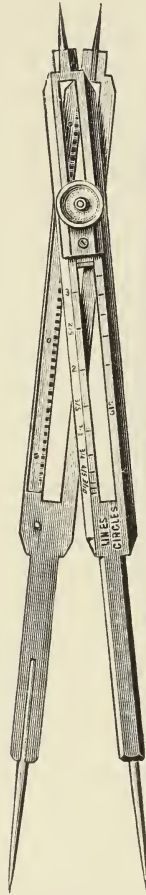


PARAGON

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 439X.

439X. Proportional Dividers, with steel parts of **stainless steel**, finely divided for lines and circles on one side and for planes and solids on the other side, $9\frac{1}{4}$ in., with Rack Movement, which greatly facilitates setting each

Morocco Case, silk velvet lined for No. 439X “

Paragon Proportional Dividers No. 439X has **Adjustable Stainless Steel Points**.

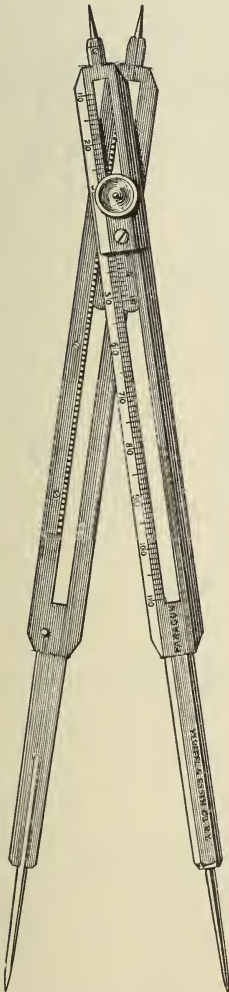
KEUFFEL & ESSER CO., NEW YORK

PARAGON

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 440X

440X. Universal Proportional Dividers, 10 in., steel parts of stainless steel, with Rack Movement, which greatly facilitates setting, in Morocco finish Case, with Table of Settings each

Universal Proportional Dividers No. 440X differs from the ordinary instrument of its kind in that its whole length is divided into 200 equal parts, which are further subdivided into tenths by means of a vernier. These graduations are not carried over the entire length of the instrument, because those seen in the figure from 10 to 110 reading with the vernier to 1000ths, are practically all that are necessary for the almost endless variety of purposes to which these Dividers may be applied. By this method of graduation any desired ratio between 1:1 and 1:1.5 may be set off. Thus, setting 483 (taken from many others in a table of settings which accompanies each instrument) gives the ratio between the diameter and the circumference of a circle; in other words, when the slide is set to this number by means of the vernier, the opening at one end will take in the diameter of a circle, and the opening between the points of the other end gives at once its circumference reduced to lineal measure. In like manner settings can be made for such ratios as the diameter of a circle and the side of an equal square, feet and metres, yards and metres, etc. The list of settings for **Lines, Planes and Solids**, inclosed with each instrument, is much more complete than the series of fixed graduations on the usual Proportional Dividers. The setting of the slide from such a table is effected more easily and more accurately than can be done by the ordinary method. By means of the fully graduated scale, very small departures from a given ratio can be detected at once.

Any other desired setting not found in the list, may be obtained by means of a very simple formula given with the table of settings.

Universal Proportional Dividers No. 440X has adjustable stainless steel points which can be re-pointed without affecting the correctness of the instrument.

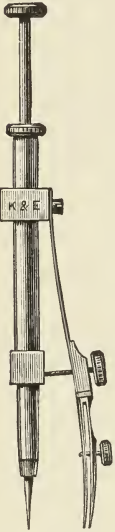


PARAGON

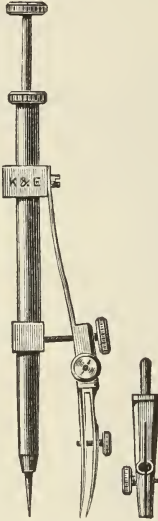
REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 453R.



454R.



461½.



462½.

453R. Drop Spring Paragon "R" Bow Pen, 4 in., spring blade, steel parts of stainless steel, for very small circles, each
Morocco Case silk velvet lined for No. 453R. "

453KX. Drop Spring Bow Pen, 4 in., knife spring blade, steel parts of stainless steel, for very small circles "
Morocco Case, silk velvet lined for No. 453 KX "

454R. Drop Spring Paragon "R" Bow Pen, spring blade, and Pencil, 4 in., steel parts of stainless steel, for very small circles "
Morocco Case, silk velvet lined for No. 454R "

454KX. Drop Spring Bow Pen, knife spring blade, and Pencil, 4 in., steel parts of stainless steel, for very small circles "
Morocco Case, silk velvet lined for No. 454 KX "

For description of Paragon "R" pens, see page 101.

For illustration and description of knife spring pens; see pages 102 and 122.

451½. Minute Steelspring Bow Pen, spring blade, with Needle Point, Metal Handle, 2¼ in. "

462½. " " " Pencil, with Needle Point, Metal Handle, 2¼ in. "

Nos. 453R, 453KX, 454R and 454KX are the most suitable instruments for drawing small circles. In these types the center rod remains stationary while the instrument is turned, and the pen and pencil draw by their own weight. This obviates slipping of the needle and scratching of the pen. (See page 101).

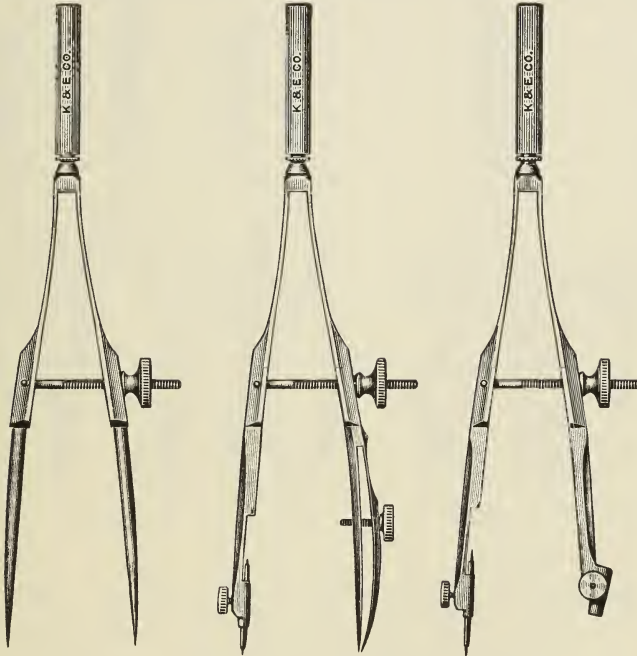
KEUFFEL & ESSER CO., NEW YORK

PARAGON

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 476.

477.

478.

- | | | | | |
|------|--------|-----|--------------------------------|-------------|
| 476. | Steele | Bow | Dividers, with nickel silver | |
| | | | Handle, | 5 in., each |
| 477. | " | " | Pen, spring blade, with Needle | |
| | | | Point, nickel silver Handle, | 5 " " |
| 478. | " | " | Pencil, with Needle Point, | |
| | | | nickel silver Handle . . . | 5 " " |

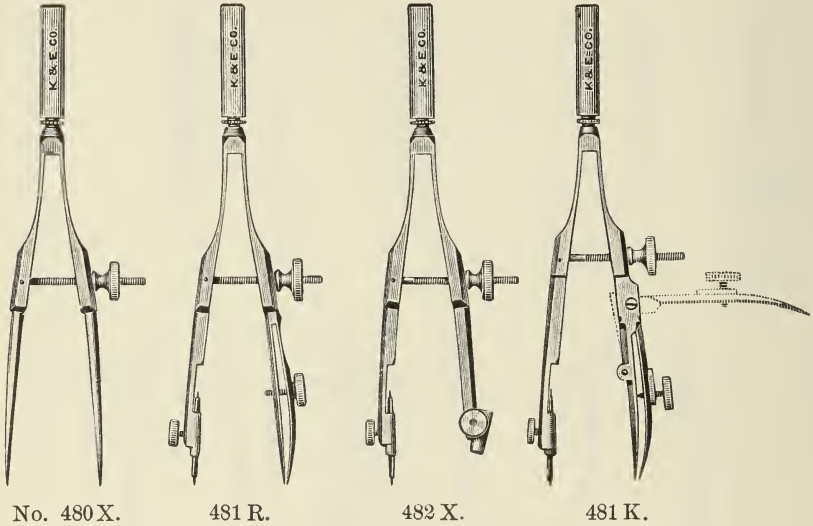


PARAGON

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



- 480 X.** Steelspring Bow Dividers, nickel silver Handle, $3\frac{3}{4}$ in.; steel parts of stainless steel each
- 481 R.** “ Paragon “R” Bow Pen, spring blade, Needle Point, nickel silver Handle, $3\frac{3}{4}$ in.; steel parts of stainless steel “
- 482 X.** “ Bow Pencil, Needle Point, nickel silver Handle, $3\frac{3}{4}$ in.; steel parts of stainless steel “
- 481 K.** “ “ Pen, Knife Spring Pen, Needle Point, nickel silver Handle, $3\frac{3}{4}$ in. “

The Knife Spring Paragon Bow Pens have a hinged upper blade actuated by a spring as in a pocket knife, which either holds the pen open at 90 degrees or presses it firmly against the fixed blade. (See page 102.)

Opening the pen for cleaning does not change the adjustment for width of line.

For illustration of Knife Spring Pen, see page 122.

- 483 C.** Case, morocco covered, velvet lined, holds three spring bows
Nos. 480X, 481R and 482X (without instruments) each

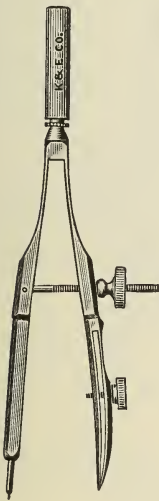


PARAGON

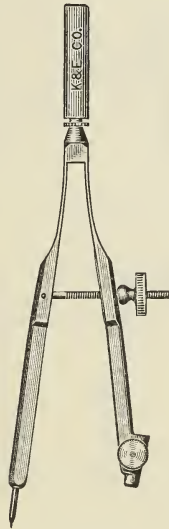
REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

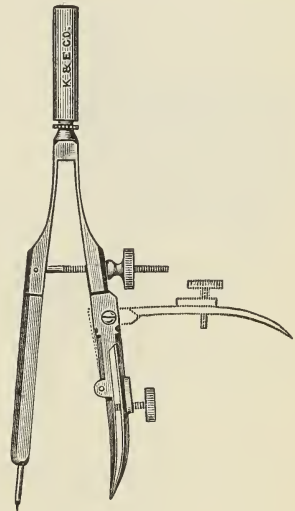
Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



481 FX.



482 FX.



481 FXK.

- | | | | | |
|----------|---|---|---|------|
| 481 FX. | “ | “ | Pen, spring blade, cushion spring needle point adjustment, nickel silver Handle, $3\frac{3}{4}$ in.; steel parts of stainless steel | each |
| 482 FX. | “ | “ | Pencil, cushion spring needle point adjustment, nickel silver Handle; $3\frac{3}{4}$ in.; steel parts of stainless steel | “ |
| 481 FXK. | “ | “ | Pen, Knife Spring Pen, cushion spring needle point adjustment; nickel silver Handle; steel parts of stainless steel | “ |

The needle point of each of the above instruments, instead of being provided with a clamp screw for adjusting purposes, is fitted with a cushion spring arrangement of patented construction inside the leg, by which the needle point can be adjusted to the pen or pencil point through a slight pressure maintained on the handle of the instrument. This arrangement is much handier than the usual clamp screw method of adjustment, especially for very small circles.

The Knife Spring Paragon Bow Pens have a hinged upper blade actuated by a spring as in a pocket knife, which either holds the pen open at 90 degrees or presses it firmly against the fixed blade. See page 102.

Opening the pen for cleaning does not change the adjustment for width of line.
For illustration of Knife Spring Pen, see page 122.

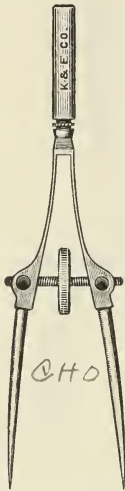


PARAGON

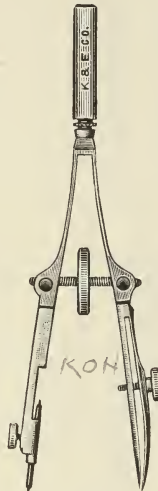
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DRAWING INSTRUMENTS.

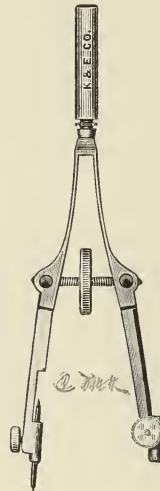
Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 485X.



486X.



487X.

- 485X. Steelspring Bow Dividers**, with central thumbscrew, nickel silver Handle, $3\frac{3}{4}$ in.; steel parts of **stainless steel** each
- 486X. Steelspring Bow Pen**, spring blade, central thumbscrew, with Needle Point, nickel silver Handle, $3\frac{3}{4}$ in.; steel parts of **stainless steel** “
- 487X. Steelspring Bow Pencil**, central thumbscrew, with Needle Point, nickel silver Handle, $3\frac{3}{4}$ in.; steel parts of **stainless steel** “

Steelspring Bows Nos. 485X, 486X and 487X are opened and closed by a right and left thread, which is operated by one thumbscrew situated between the shanks of the instrument; this thread also holds the points rigidly and doubles the speed of the screw. (See page 100).

- 486K. Steelspring Bow Pen**, central thumbscrew, **Knife Spring Pen**, Needle Point, nickel silver Handle, $3\frac{3}{4}$ in. each

The **Knife Spring Paragon Bow Pens** have a hinged upper blade actuated by a spring similar to a pocket knife, which either holds the pen open at 90 degrees or presses it firmly against the fixed blade. (See page 102).

Opening the pen for cleaning does not change the adjustment for width of line. For illustration of Knife Spring Pen, see page 122.

- 488C. Case**, morocco covered, velvet lined, holds three spring bows No. 485X, 486X and 487X (without instruments) each

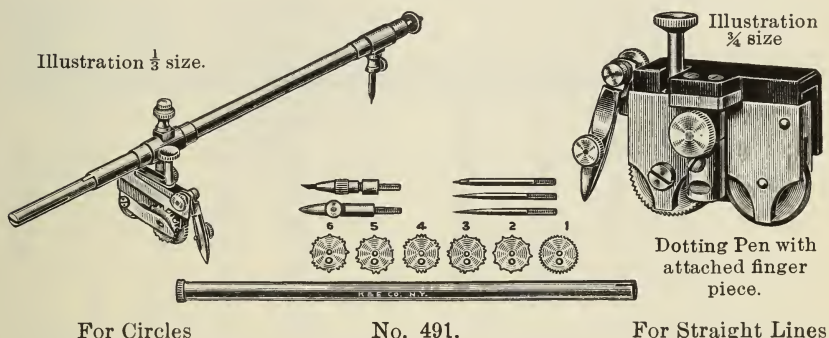


PARAGON

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



- 491. Paragon Dotting Instrument and Beam Compasses, for Circles and Straight Lines.** Nickel silver, 12 in., 2 Round Bars, Dotting Pen, Pen and Pencil Points (the Pen Points have Spring Blade), 2 Steel Needle Points, 1 Shouldered Needle for use with Dotting Pen, 1 Shouldered Needle for use with Pen or Pencil Point, Micrometer Adjustment. In velvet lined morocco Case, with bar lock each

This instrument for drawing dotted circles and straight lines is of practical construction and does good work. The propelling and supporting wheels of the dotting pen travel on the drawing and are, therefore, not so liable to slip as those which travel on a straightedge. For dotting circles, the dotting pen is clamped to the bar; for dotting straight lines along a straightedge, there is a finger piece, for attachment to the dotting pen; this also serves as a handle.

There are 6 ratchet wheels which are readily interchangeable by lifting the flat spring which holds them on their pivots. They produce the following patterns:

N ^o 1	N ^o 4
" 2	" 5
" 3	" 6

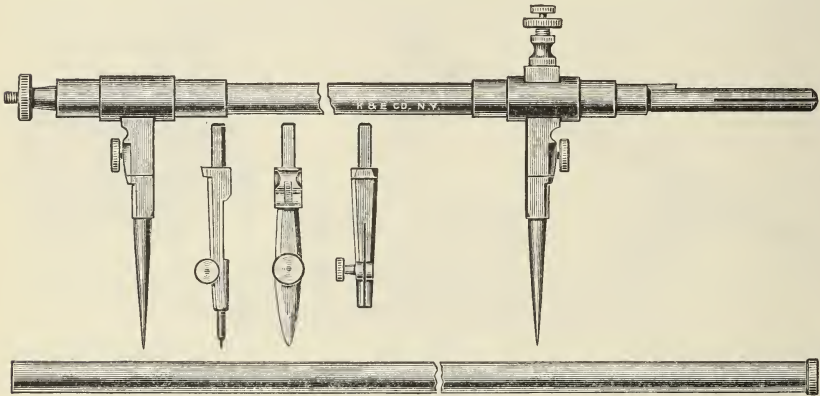


PARAGON

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

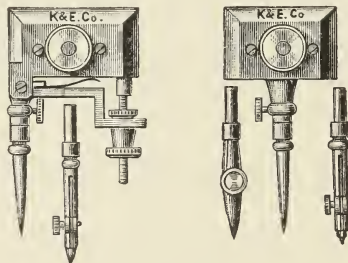
Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon



No. 501

501. Tubular Beam Compasses, 27 in., 3 round nickel silver Bars, 2 Steel Points, Pen, Pencil and Needle Point, Micrometer Adjustment each
- 502X. Tubular Beam Compasses, like No. 501, but 38 in., steel parts of stainless steel “
- The bar of No. 502X is heavier than that of No. 501.
503. Wheel Attachment for No. 501 “
504. “ “ “ “ 502X “

Morocco Case, silk velvet lined,
for No. 501, each for No. 502X each
“ No. 501 with 503 “ “ No. 502X with 504 “

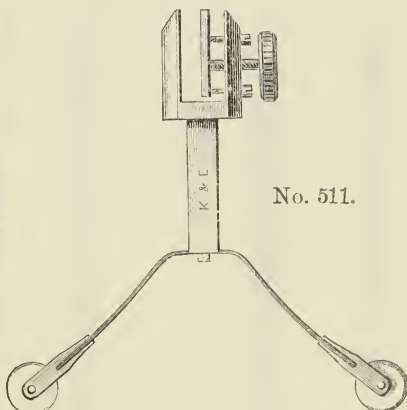
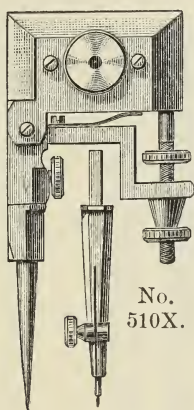
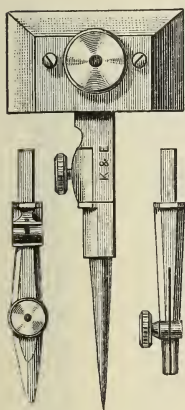


No. 509.

509. Minute Beam Compasses with 2 Steel Points, Pen, Pencil and Needle Point, Micrometer Adjustment each
- 509½. Wheel Attachment for No. 509 (for illustration see No. 511) “
- Morocco Case, silk velvet lined, for No. 509 “
- do. do. “ “ “ “ “ 509 with No. 509½ “

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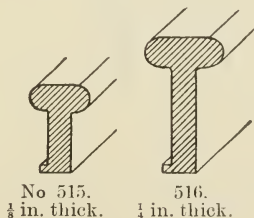
Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No.
510X.

No. 511.

- | | | |
|--------------|---|------|
| 510X. | Beam Compasses, steel parts of stainless steel, with 2 Steel Points, Pen, Pencil and Needle Point, Micrometer Adjustment | each |
| | Morocco Case, silk velvet lined, for No. 510X | " |
| 511. | Wheel Attachment for No. 510X | " |
| | Morocco Case, silk velvet lined, for Nos. 510X with 511 . . | " |



No 515.
 $\frac{1}{8}$ in. thick.

516.
 $\frac{1}{4}$ in. thick.

- | | | | | | | |
|------|---|----|----|----|----|--------|
| 515. | Hardwood Bars for Beam Compasses No. 509. | | | | | |
| | 24 | 30 | 36 | 42 | 48 | 60 in. |
| | each | | | | | |

No. 515 is old No. 2280.

- 516. Hardwood Bars** for Beam Compasses Nos. 510X and 954,
24 30 36 42 48 60 in.
each

No. 516 is old No. 2282.

In ordering these bars, please state catalogue number of beam compasses.



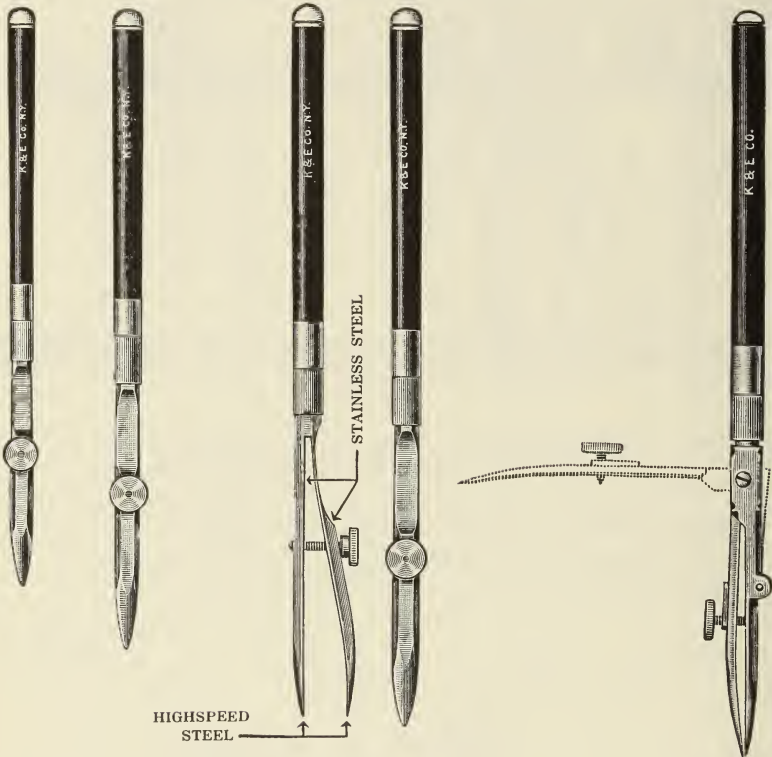
PARAGON

REG. U. S. PAT. OFF.

WYTETIP "R" DRAWING PENS.

TRADE MARK

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.
with "R" stamped on lower blade.



No. 522R.

523R.

524R.

524 K.R.

522R. Paragon WYTETIP "R" Drawing Pen, upper blade with spring, $4\frac{1}{2}$ in. each

523R. " " " " " " " " 5 " "

524R. " " " " " " " " $5\frac{1}{2}$ " "

All of the pens on this page are made with points of highspeed steel butt-welded to blades of stainless steel. They can be identified by the white tip at the end of the handle and by the letter "R" stamped on the outside of the lower blade.

For a further description of these pens, see page 101.

522KR. Knife Spring Paragon WYTETIP "R" Drawing Pen, $4\frac{1}{2}$ in., each

523KR. " " " " " " " " 5 " "

524KR. " " " " " " " " $5\frac{1}{2}$ " "

The Knife Spring Paragon Pens have a hinged upper blade actuated by a spring similar to a pocket knife, which either holds the pen open at 90 degrees or presses it firmly against the fixed blade. (See page 101).

Opening the pen for cleaning does not change the adjustment for width of line.



PARAGON

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 525.



526.



527.



528

525. Drawing Pen, upper blade with spring, 6 in., with handle tapering down from $\frac{3}{8}$ in. diameter each
526. Drawing Pen with Joint, 4 in. “
527. “ “ “ “ and Pricker Pin, 5 in. “
528. “ “ “ “ “ “ “ $5\frac{1}{2}$ “ “



PARAGON

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 531.



532 X.



533 R.

- 531. Hatching Pen**, extra fine, with Pushing Screw, 6 in. each
No. 531 is old No. 690.

- 532 X. Improved Drawing Pen**, $5\frac{1}{4}$ in., steel parts of stainless steel, without thumbscrew “

This pen opens and closes by turning the set screw at the upper end of the handle—a decided improvement on the screw through the blades arrangement—preventing displacement of the nibs sideways. As there is no obstruction to the sight in working, this pen is preferable for fine work. (See page 103).

No. 532X is old No. 695.

- 533 R. Improved Paragon “R” Curve Pen** $4\frac{3}{4}$ in., spring blade, each

No. 533R is old No. 696.

This pen has a hollow handle in which a thin rod rotates. The blades being fastened to the end of the rod and being eccentric to it, turn easily and follow the smallest curve with precision. By means of a nut at the upper end of the rod, the pen can be clamped and may then be used as a regular drawing pen.

No. 533R is made with points of high-speed steel butt-welded to blades of stainless steel. It can be identified by the letter “R” stamped on the side of the lower blade (see page 101).



PARAGON

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 535.



536.

535. Border Pen, for broad lines, $6\frac{1}{2}$ in. each
536. “ “ “ “ improved $6\frac{1}{2}$ in. “

Border Pen No. 536 may be used also as a Railroad Pen by filling only the two pairs of blades with ink.

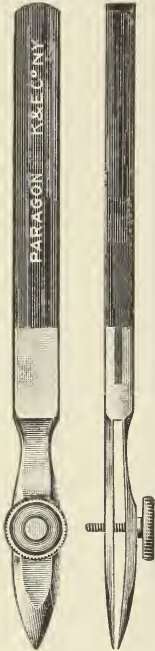
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PARAGON

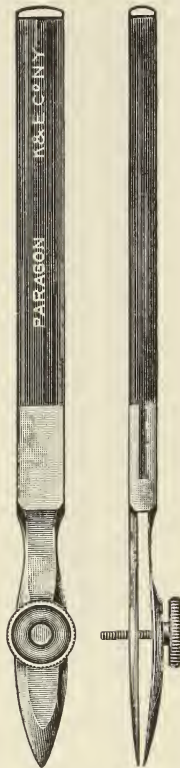
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DRAWING INSTRUMENTS.

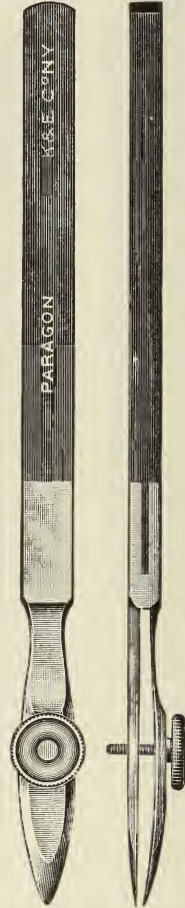
Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 538-1.



538-2R.



538-3.

538-1. Detail Drawing Pen, 5 in., upper blade with spring, flat Handle each

538-2R. WYTETIP "R" Detail Drawing Pen, 6 in., upper blade with spring, flat Handle "

Pen No. 538-2R has points of highspeed steel butt-welded to blades of stainless steel. It can be identified by the white tip at the end of the handle and by the letter "R" stamped on the outside of the lower blade. For a further description of Paragon "R" pens, see page 161.

538-3. Detail Drawing Pen, 7 in., upper blade with spring, flat Handle each

Nos. 538-1 to 538-3 are old Nos. 558-1 to 558-3.

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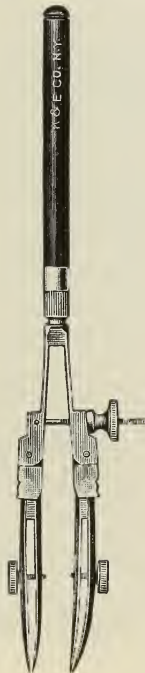
REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 543.



545.



546



551.



556X.

543. Railroad Pencil, 5 in. each

545. Railroad Pen with spring blade, and joints in shanks, 5 in. “

No. 545 has both pens bent in the same direction, so that lines can be drawn against a straightedge or rule as readily as with a ruling pen.

546. Improved Railroad Pen, 5½ in., spring blades “

The construction of this pen is like that of No. 533R (page 124) with the exception that it has two pairs of carbon steel blades.

No. 546 is old No. 697.

551. Dotting Pen, nickel silver, with 6 Wheels, improved, 6 in. “

The improved Dotting Pen No. 551, is doubtless the best pen for the purpose, as it entirely prevents blotting, provided the ink is not too thin. The reservoir, after being filled, is closed and supplies no more ink to the dotting wheel than is actually required.

556X. Tracer, steel parts of stainless steel, 5 in. “



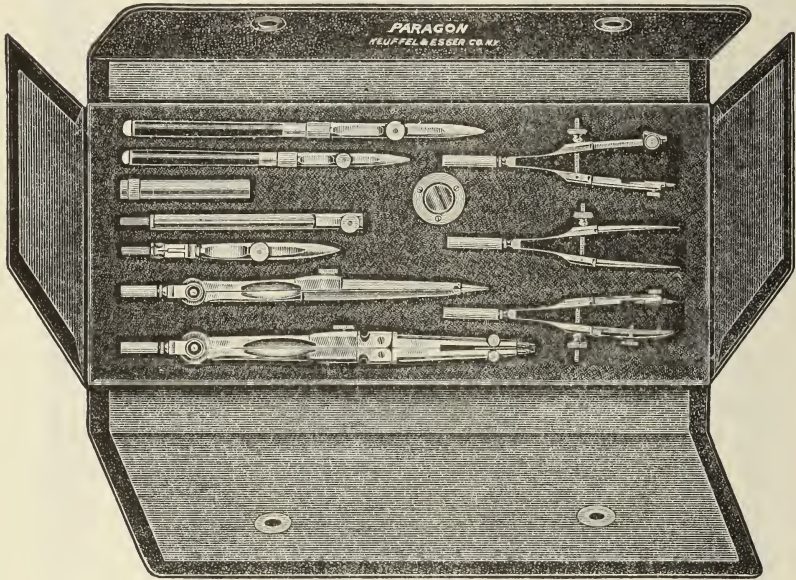
PARAGON

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

HEAVY LEATHER CASES, SILK VELVET LINED.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 624RX.

624RX. Pocket Case containing:-

- 1 Compasses, $6\frac{1}{2}$ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 610RX,
- 1 Hairspring Dividers, $5\frac{3}{4}$ in., No. 608X,
- 1 Steelspring Bow Dividers, $3\frac{3}{4}$ in. No. 480X,
- 1 " Bow Pen, $3\frac{3}{4}$ " " 481R,
- 1 " Bow Pencil, $3\frac{3}{4}$ " " 482X,
- 1 WYTETIP "R" Drawing Pen, $4\frac{1}{2}$ in., upper blade with spring, No. 522R,
- 1 WYTETIP "R" Drawing Pen, $5\frac{1}{2}$ in., upper blade with spring, No. 524R,
- 1 Horn Center, nickel silver rim, $\frac{3}{4}$ in. dia., No. 2691,
- 1 Nickel silver Box with Leads, No. 614 set

- 624CRX. Pocket Case,** containing same assortment as No. 624RX, but with Spring Bows Nos. 485X, 486X, and No. 487X, (with central thumbscrew) in place of Nos. 480X, 481R, and 482X. "

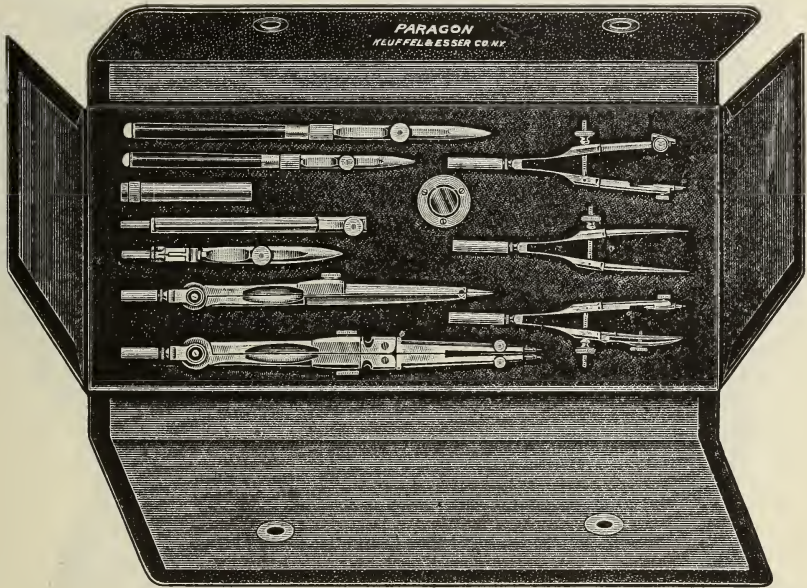
KEUFFEL & ESSER CO., NEW YORK

PARAGON

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon



No. 624 HRX.

624 HRX. Pocket Case, containing:-

- 1 Compasses, $6\frac{1}{4}$ in., fixed Needle Point with Hair-spring, Pen, Pencil Point and Lengthening Bar, No. 610 HRX,
- 1 Hairspring Dividers, $5\frac{3}{4}$ in., No. 608X,
- 1 Steelspring Bow Dividers, $3\frac{3}{4}$ in., No. 480X,
- 1 " Bow Pen, $3\frac{3}{4}$ " 481R,
- 1 " Bow Pencil, $3\frac{3}{4}$ " 482X,
- 1 WYTETIP "R" Drawing Pen, $4\frac{1}{2}$ in., upper blade with spring, No. 522R,
- 1 WYTETIP "R" Drawing Pen, $5\frac{1}{2}$ in., upper blade with spring, No. 524R,
- 1 Horn Center, nickel silver rim, $\frac{3}{4}$ in. dia., No. 2691,
- 1 Nickel silver Box with Leads, No. 614 set

624 HCRX. Pocket Case, containing same assortment as No. 624HRX, but with Spring Bows Nos. 485X, 486X, and 487X (central thumbscrew) in place of Nos. 480X, 481R, and 482X "

The steel parts of the instruments in the above sets are of stainless steel, with the exception of the points of the "R" pens, which are highspeed steel. See description, page 101.

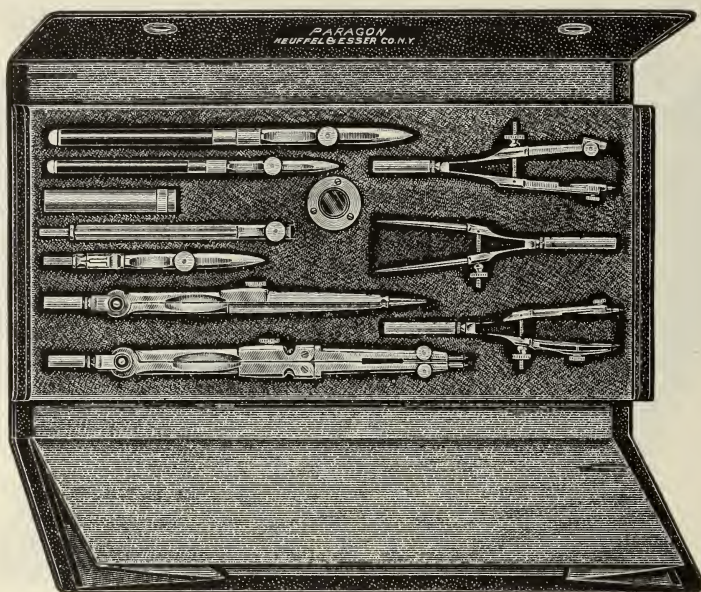
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PARAGON

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 624 ARX.

624 ARX. Improved Pocket Case, with pocket, containing:-

- 1 Compasses, $6\frac{1}{4}$ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 610RX,
- 1 Hairspring Dividers, $5\frac{3}{4}$ in., No. 608X,
- 1 Steelspring Bow Dividers, $3\frac{3}{4}$ in., No. 480X,
- 1 " Bow Pen, $3\frac{3}{4}$ " 481R,
- 1 " Bow Pencil, $3\frac{3}{4}$ " 482X,
- 1 WYTETIP "R" Drawing Pen, $4\frac{1}{2}$ in., upper blade with spring, No. 522R,
- 1 WYTETIP "R" Drawing Pen, $5\frac{1}{2}$ in., upper blade with spring, No. 524R,
- 1 Horn Center, nickel silver rim, $\frac{3}{4}$ in. dia. No. 2691,
- 1 Nickel silver Box with Leads, No. 614 set

624 ACRX. Improved Pocket Case, with pocket, containing same assortment as No. 624 ARX, but with Spring Bows Nos. 485 X, 486 X and 487 X (with central thumb-screw) in place of Nos. 480 X, 481 R, and 482 X

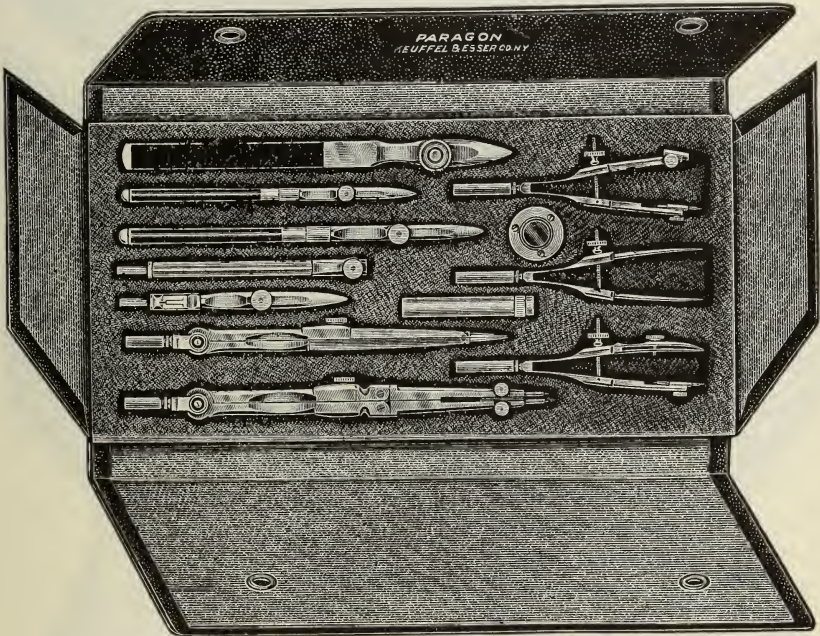


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REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 624 $\frac{1}{2}$ RX.

624 $\frac{1}{2}$ RX. Pocket Case, containing:-

- 1 Compasses, 6 $\frac{1}{4}$ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 610RX,
- 1 Hairspring Dividers, 5 $\frac{3}{4}$ in., No. 608X,
- 1 Steelspring Bow Dividers, 3 $\frac{3}{4}$ in. No. 480X,
- 1 " Bow Pen, 3 $\frac{3}{4}$ " 481R,
- 1 " Bow Pencil, 3 $\frac{3}{4}$ " 482X,
- 1 WYTETIP "R" Drawing Pen, 4 $\frac{1}{2}$ in., upper blade with spring, No. 522R,
- 1 WYTETIP "R" Drawing Pen, 5 $\frac{1}{2}$ in., upper blade with spring, No. 524R,
- 1 WYTETIP "R" Detail Drawing Pen, 6 in., upper blade with spring, No. 538-2R,
- 1 Horn Center, nickel silver rim, $\frac{3}{4}$ in. dia., No. 2691
- 1 Nickel silver Box with Leads, No. 614 set

624 $\frac{1}{2}$ CRX. Pocket Case, containing same assortment as No. 624 $\frac{1}{2}$ RX, but with Spring Bows Nos. 485X, 486X, and 487X (central thumbscrew) in place of Nos. 480X, 481R, 482X. "

The steel parts of the instruments in the above sets are of stainless steel, with the exception of the points of the "R" pens, which are highspeed steel. See description page 101.

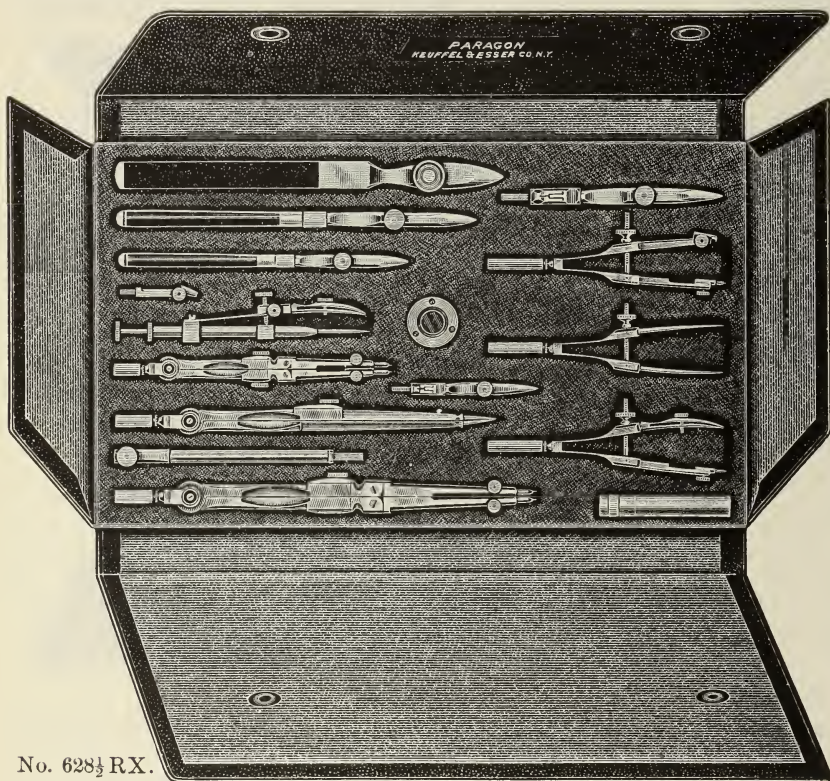
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DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 628½ RX.

628½ RX. Pocket Case, containing:-

- 1 Compasses, 6½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 610RX.
- 1 Compasses 4½ in., fixed Needle and Pen Point, No. 603H.
- 1 Hairspring Dividers, 5¾ in., No. 608X,
- 1 Steelspring Bow Dividers, 3¾ in., No. 480X,
- 1 " Bow Pen, 3¾ in., No. 481R,
- 1 " Bow Pencil, 3¾ in., No. 482X,
- 1 Drop Spring Bow Pen and Pencil, 4 in. No. 454R,
- 1 WYTETIP "R" Drawing Pen, upper blade with spring, 4½ in., No. 522R,
- 1 WYTETIP "R" Drawing Pen, upper blade with spring, 5½ in., No. 524R,
- 1 WYTETIP "R" Detail Drawing Pen, upper blade with spring, 6 in., No. 538-2R,
- 1 Horn Center, nickel silver rim, ¾ in. dia., No. 2691,
- 1 Nickel silver Box with Leads, No. 614 set

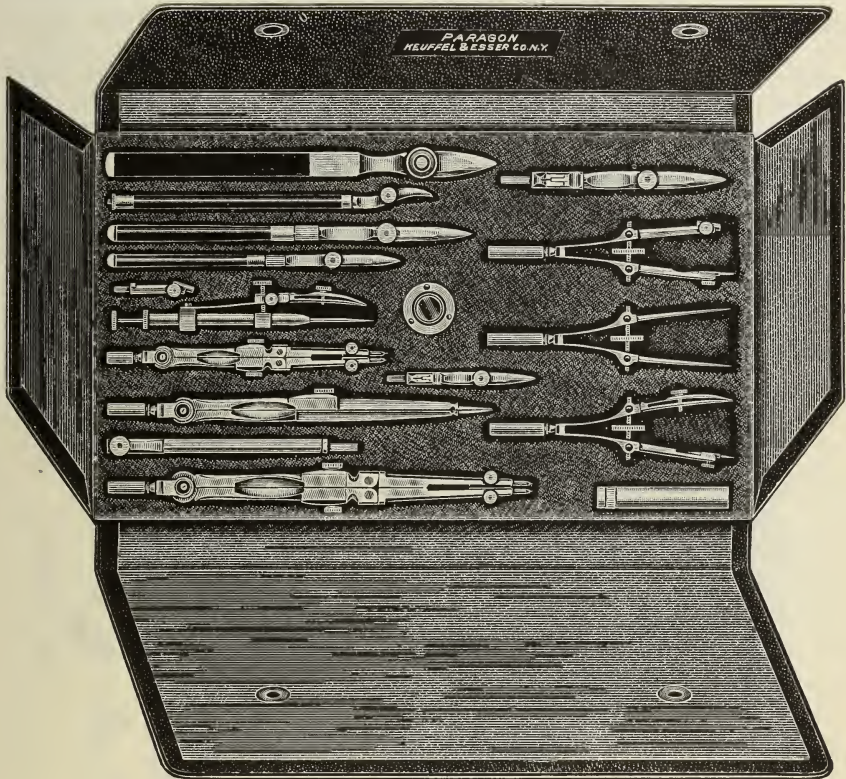
628½ CRX. Pocket Case containing same assortment as No. 628½ RX but with Spring Bows, Nos. 485X, 486X and 487X (central thumbscrew) in place of Nos. 480X, 481R and 482X. "

The steel parts of the instruments in the above sets are of stainless steel, with the exception of No. 603H. The points of the "R" pens are highspeed steel. See page 101.

KEUFFEL & ESSER CO., NEW YORK

PARAGON REG. U. S. PAT. OFF. DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 629CRX.

629RX. Pocket Case containing:-

- 1 Compasses, $6\frac{1}{4}$ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 610RX.
- 1 Compasses, $4\frac{1}{2}$ in., with fixed Needle and Pen Point, No. 603H.
- 1 Hairspring Dividers, $5\frac{3}{4}$ in., No. 608X.
- 1 Steelspring Bow Dividers, $3\frac{3}{4}$ in., No. 480X.
- 1 " Bow Pen, $3\frac{3}{4}$ " 481R.
- 1 " Bow Pencil $3\frac{3}{4}$ " 482X.
- 1 Drop Spring Bow Pen and Pencil, 4 in., No. 454R.
- 1 WYTETIP "R" Drawing Pen, $4\frac{1}{2}$ in., upper blade with spring, No. 522R.
- 1 WYTETIP "R" Drawing Pen, $5\frac{1}{2}$ in., upper blade with spring, No. 524R.
- 1 WYTETIP "R" Pen, 6 in., upper blade with spring, No. 538-2R.
- 1 Improved "R" Curve Pen, $4\frac{3}{4}$ in., with spring blade, No. 533R.
- 1 Horn Center, nickel silver rim, $\frac{3}{4}$ in. dia., No. 2691.
- 1 Nickel silver Box with Leads, No. 614 set

629CRX. Pocket Case containing same assortment as No. 629RX, but with Spring Bows Nos. 485X, 486X and 487X, (with central thumb-screw) in place of Nos. 480X, 481R and 482X "

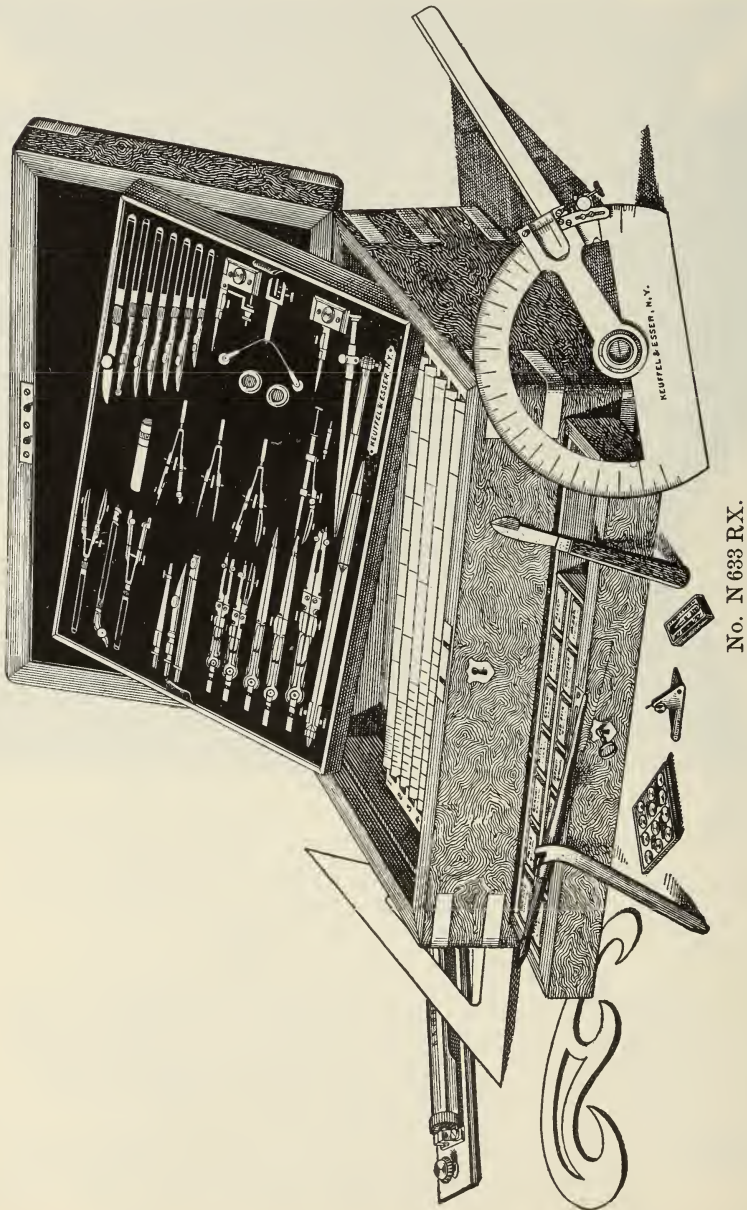
The steel parts of the instruments in the above sets are of stainless steel, with the exception of No. 603H. The points of the "R" pens are highspeed steel. See page 101.

KEUFFEL & ESSER CO., NEW YORK

PARAGON

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.



No. N 633 RX.

KEUFFEL & ESSER CO., NEW YORK

PARAGON

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon

N633RX. Fine polished Mahogany Case, with Tray lined with Silk Velvet. Drawer, nickel silver Bands and Corners, with Lock, (see illustration) containing:

- 1 Compasses 6½ in., with fixed Needle Point, with Hairspring, Pen, Pencil Point, Lengthening Bar, No. 610 HRX,
- 1 Compasses, 4½ in., with fixed Needle and Pen Point and with Hairspring, No. 604 H,
- 1 Compasses, 4½ in., with fixed Needle and Pencil Point and with Hairspring No. 605 H,
- 1 Plain Dividers, 5¾ in., No. 606 X,
- 1 Hairspring Dividers, 5¾ in., No. 608 X,
- 1 Three legged Dividers, No. 431,
- 1 "Universal" Proportional Dividers with replaceable Points, No. 440 X,
- 1 Drop Spring Bow Pen and Pencil, No. 454 R,
- 1 Set Steelspring Dividers and Bows, No. 485 X, 486 K, 487 X,
- 1 Beam Compasses No. 510 X, with Wheel Attachment No. 511,
- 1 WYTETIP "R" Drawing Pen, 4½ in., No. 522 KR,
- 2 " " " 5 " " 523 KR,
- 2 " " " 5½ " " 524 KR,
- 1 " Detail Drawing Pen, 6 in., No. 538-2R,
- 1 Railroad Pencil, 5 in., No. 543,
- 1 Improved Curve Pen, 4½ in., No. 533 R,
- 1 Railroad Pen, 5 in., No. 546,
- 1 Dotted Pen, 6 " " 551,
- 2 Horn Centers with nickel silver rim, No. 2691,
- 1 Nickel Silver Box with Leads, No. 614,
- 1 Set (8) Paragon Scales No. 1576 P,
- 1 Paper Cutter, No. 2701,
- 1 Protractor, No. 1226 T,
- 1 Brass Parallel Rule, No. 1756,
- 2 doz. each Nickel Silver Thumb Tacks, Nos. 2643, 2644,
- 1 Tacklifter, No. 2680,
- 1 each Xylonite Triangle, No. 1855, 6, 8, 12 in.,
- 1 " " " " 1856, 4, 7, 10 "
- 1 " " Curve, " 1860, 4, 13, 19
- 1 each red Sable Brush, No. 3121, 0 N, 1 N, 3 N, 5 N, 7 N, 9 N,
- 1 doz. Lettering Pens, No. 3202, with Holder,
- 3 Artist Pencils, No. 3383,
- 3 Boxes Leads, No. 3385,
- 2 Cakes Red Rubber, No. 3455 R-24,
- 1 Cake Ink Eraser, No. 3457,
- 1 Cake Ink and Pencil Eraser, No. 3458-1,
- 1 Steel Eraser, No. 3481,
- 1 Pencil Pointer, No. 3507, set

The above assortment will be changed to suit the wishes of the customer.
Prices quoted on request.



PARAGON

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS

To accommodate our customers, separate parts for our Drawing Instruments are kept in stock, as listed below.

As all inserts for compasses are carefully fitted by hand, they are not interchangeable, but must be fitted to the instrument. The charge for such fitting is included in the price.

PARTS FOR PARAGON INSTRUMENTS.

Pen Legs, Pencil Legs, Needle Legs, for Compasses	each
do. do. do. " Beam Compasses	"
Lengthening Bars for Compasses	"
Handles for Drawing Pens Nos. 525 to 538-3	"
Handles for Drawing Pens Nos. 531 to 546	"
Aluminum Handles for Drawing Pens	"
Nickel Silver Handles for Compasses, Dividers and Bow Instruments	"
Screw Bar for Sidescrew Bows	"
Adjusting Nuts for Sidescrew Bows	"
Center Screws and Nuts for Bows with Central Thumbscrew	"
Clampscrews and Adjusting Thumbscrews	"
Nuts	"
Shouldered Needles	"

SPECIAL CASES

FOR

PARAGON DRAWING INSTRUMENTS

MADE TO ORDER

See Nos. 1101 to 1103, page 187.

KEUFFEL & ESSER CO., NEW YORK

PHAROS

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

FLAT TYPE

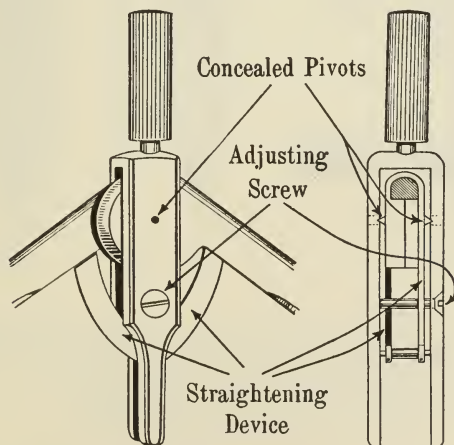
Each instrument stamped KEUFFEL & ESSER CO., N. Y., or K & E Co., N. Y. Pharos.

PHAROS Instruments are the finest in design, quality and appearance that it is possible to produce in the flat type. They are made of the best rolled nickel silver and steel, by the same class of artisans and in the same factory as Paragon Instruments. Since they are of the flat type, it follows that their lower cost is largely the result of machine work; the finishing and fitting of the parts by skilled hand workers (necessary to the high-quality of Paragon Instruments) being dispensed with. While they are not comparable with Paragon, they are **superior to any other instrument of the flat type.**

Drawing Pens. The pens furnished with the Pharos sets are **Paragon WYTETIP "R"** pens; and consequently are the very highest quality (see page 101).

Each set of **Pharos** instruments contains an extra nickel silver handle, into the socket of which the compasses pen fits, thus making available an additional drawing pen.

Compasses and Dividers. The heads of the **Pharos** Compasses and Dividers are of the concealed pivot-joint type, which is not only easily adjusted without direct action upon the pivots themselves, but maintains the correct relation between the friction of the various parts. A straightening device assures the vertical position of the handle under all conditions.



Spring Bows. **Pharos** bows are set by means of a central thumbscrew, the advantages of which are fully described on page 100.

Case. **Pharos** Pocket Cases are made of an exceptionally high quality heavy leather, and are lined with high grade blue velvet.



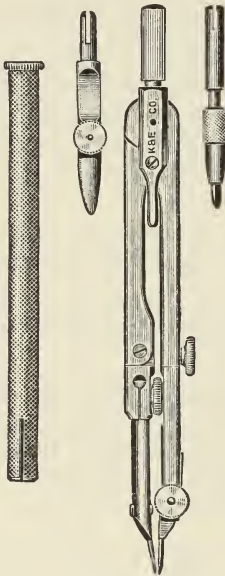
PHAROS

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS

FLAT TYPE

Each instrument stamped KEUFFEL & ESSER CO., N. Y., or K & E Co., N. Y. Pharos.



No. 643



OK

No. 659.



646.



648.

- | | | |
|------|--|------|
| 643. | Compasses, 4 in., with Hairspring, and with straightening device, fixed Needle Point, Pen with spring blade, Pencil Point, and Extra Handle to convert pen to ruling pen | each |
| 646. | Plain Dividers, 6 in., with straightening device | " |
| 648. | Hairspring Dividers, 6 in., with straightening device | " |
| 659. | Nickel Silver Box, with leads | " |



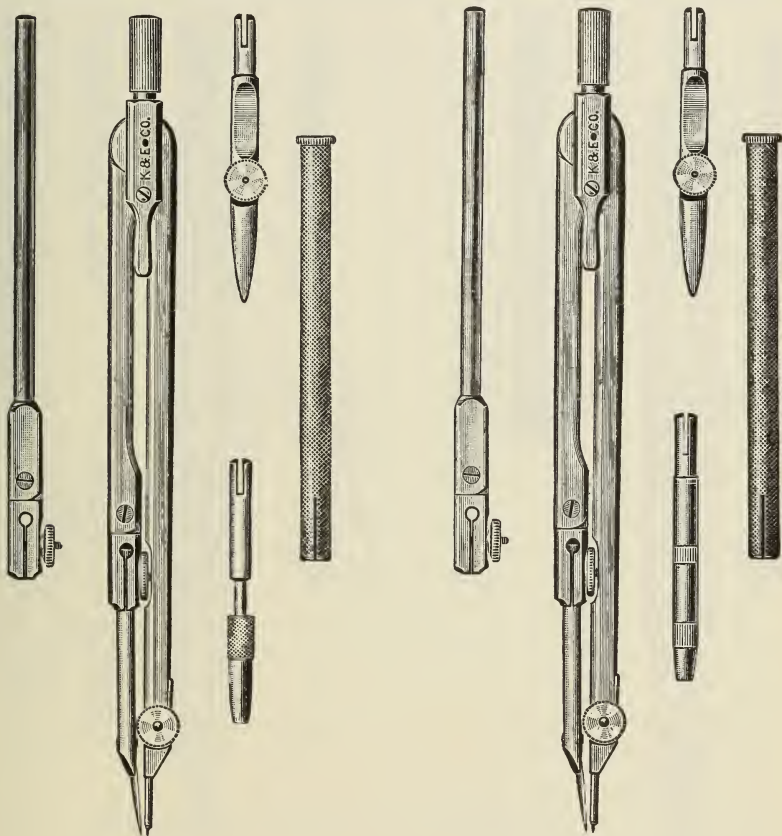
PHAROS

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

FLAT TYPE

Each instrument stamped KEUFFEL & ESSER CO., N. Y. or K. & E. CO., N. Y., Pharos.



No. 650

No. 650A

650. Compasses, 6 in., with straightening device, fixed Needle Point, Pen with spring blade, Pencil Point, Lengthening Bar, and Extra Handle to convert pen to ruling pen..... each

650A. Compasses, 6 in., similar to No. 650, but with patent adjusting device for the pencil point “

On No. 650A the pencil point is adjustable to length by rotating a collar. This design forms a quick and efficient method for bringing the lead into correct relationship with the needle.



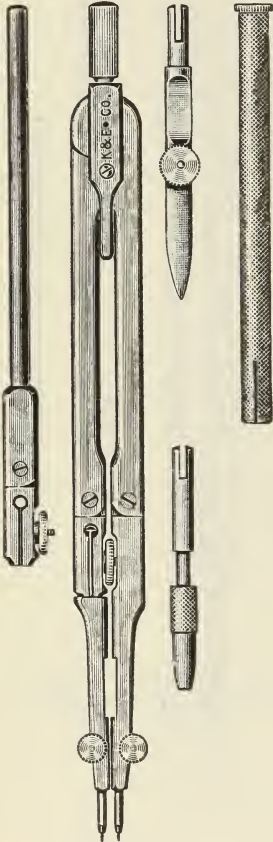
PHAROS

REG. U. S. PAT. OFF.

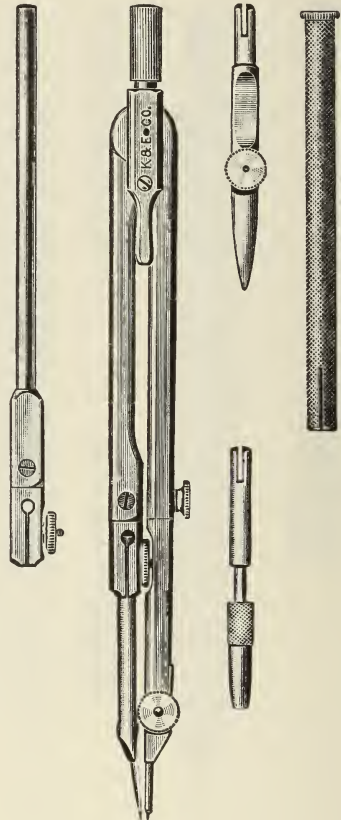
DRAWING INSTRUMENTS.

FLAT TYPE

Each instrument stamped KEUFFEL & ESSER CO., N. Y., or K & E Co., N. Y., Pharos.



No. 650 $\frac{1}{2}$.



No. 651.

650 $\frac{1}{2}$. Compasses, 6 in., with straightening device, knee joints in both legs, and fixed Needle Point, Pen with spring blade, Pencil Point, Lengthening Bar, and Extra Handle to convert pen to ruling pen. each

651. Compasses, 6 in., with Hairspring, and with fixed Needle Point, Pen with spring blade, Pencil Point, Lengthening Bar, and Extra Handle to convert pen to ruling pen. “



PHAROS

REG. U. S. PAT. OFF.

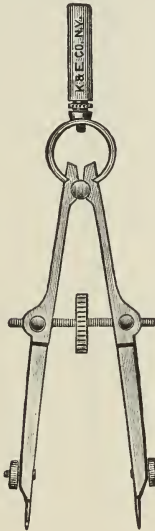
DRAWING INSTRUMENTS

FLAT TYPE

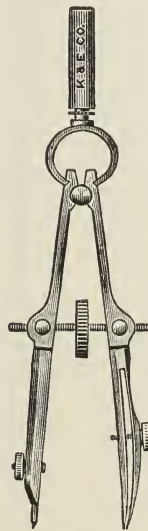
Each instrument stamped KEUFFEL & ESSER CO., N. Y., or K & E CO., N. Y. Pharos.



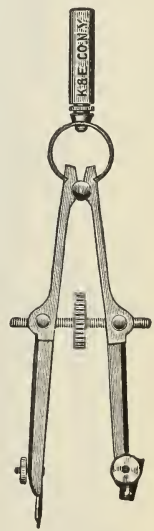
No. 664.



665.



666.



667.

- | | | |
|------|---|------|
| 664. | Drop Spring Bow Pen, spring blade, and Pencil, $4\frac{3}{4}$ in. | each |
| 665. | Ringhead Bow Dividers, $3\frac{3}{4}$ in., nickel silver handle, with central thumbscrew. | " |
| 666. | Ringhead Bow Pen, $3\frac{3}{4}$ in., nickel silver handle, with central thumbscrew. | " |
| 667 | Ringhead Bow Pencil, $3\frac{3}{4}$ in., nickel silver handle, with central thumbscrew | " |



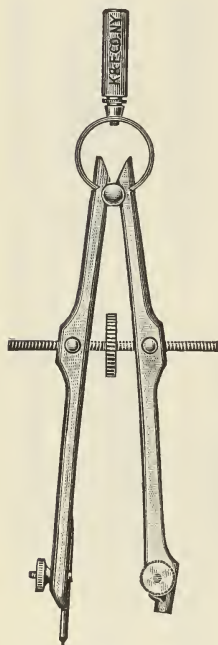
PHAROS

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS

FLAT TYPE

Each Pharos instrument, stamped KEUFFEL & ESSER CO., N. Y., or K & E Co., N. Y., Pharos.



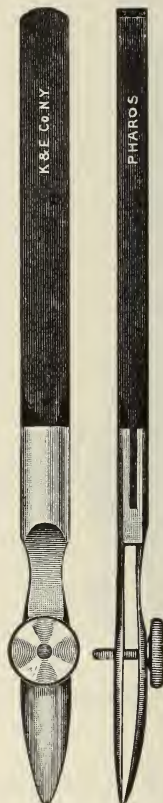
No. 669.



522R.



524R.



677.

- 669. Ringhead Bow Pencil, 5 in., nickel silver legs and handle, with central thumbscrew.....each
- 522R. Paragon WYTETIP "R" Drawing Pen, stainless steel blades with highspeed steel points, upper blade with spring, 4½ in.. "
- 524R. Paragon WYTETIP "R" Drawing Pen, stainless steel blades with highspeed steel points, upper blade with spring, 5½ in.. "
- 677. Detail Drawing Pen, 6 in., upper blade with spring..... "

For description of Paragon WYTETIP "R" pens, see page 101.

KEUFFEL & ESSER CO., NEW YORK

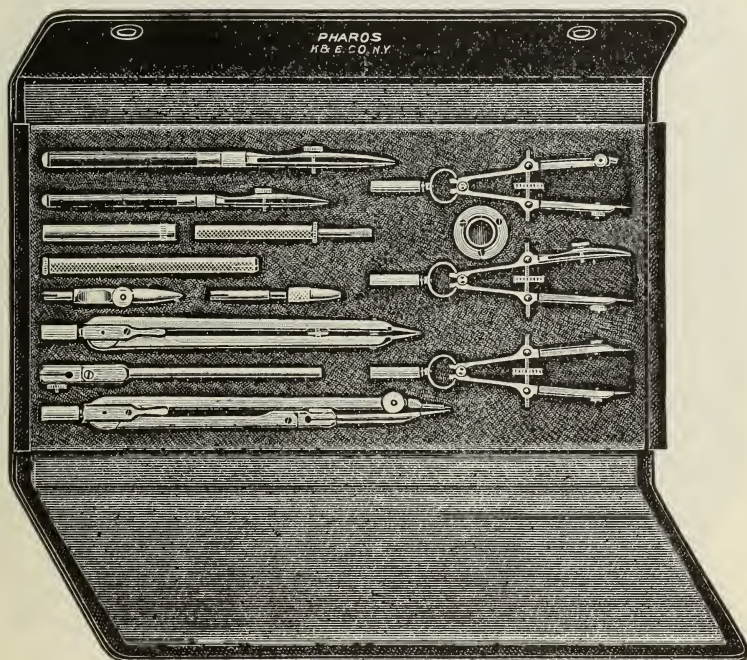
PHAROS

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

FLAT TYPE

Each Pharos instrument stamped KEUFFEL & ESSER CO., N. Y., or K & E Co., N. Y. Pharos.



No. 686.

686. Pocket Case, containing:

- 1 Compasses, 6 in., with straightening device, and fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 650,
- 1 Hairspring Dividers with straightening device, 6 in., No. 648,
- 1 Ringhead Bow Dividers, $3\frac{3}{4}$ in., with central thumbscrew, No. 665,
- 1 Ringhead Bow Pen, $3\frac{3}{4}$ in., with central thumbscrew, No. 666,
- 1 Ringhead Bow Pencil, $3\frac{3}{4}$ in., with central thumbscrew, No. 667,
- 1 Paragon WYTETIP "R" Drawing Pen, $4\frac{1}{2}$ in., upper blade with spring, No. 522R,
- 1 Paragon WYTETIP "R" Drawing Pen, $5\frac{1}{2}$ in., upper blade with spring, No. 524R,
- 1 Extra Handle, 3 in., for Compasses Pen,
- 1 Horn center, nickel silver rim, $\frac{3}{4}$ in. dia., No. 2691,
- 1 Nickel Silver Box, with assorted leads, No. 659,
- 1 Screw-driver, with magazine in handle, containing assorted Needle Pointsset

For description of Paragon WYTETIP "R" pens, see page 101.



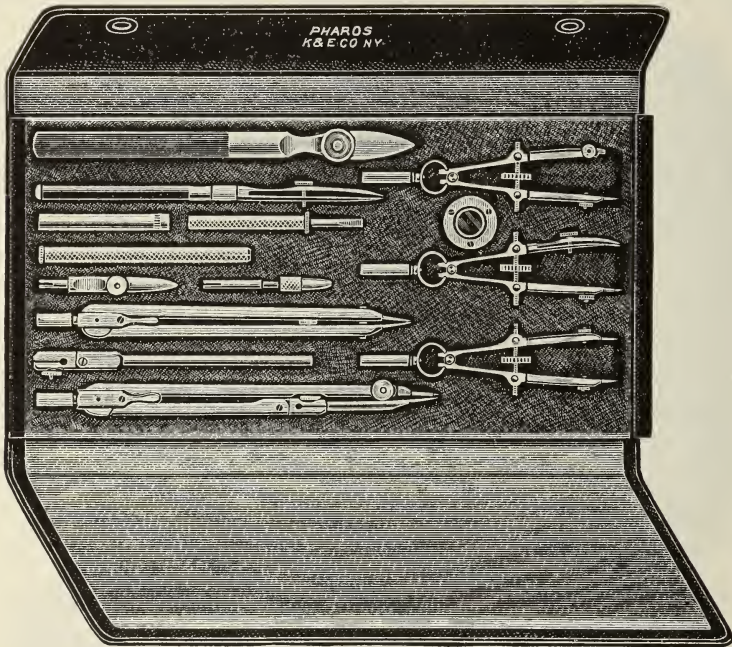
PHAROS

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

FLAT TYPE

Each Pharos instrument stamped KEUFFEL & ESSER CO., N. Y., or K & E CO., N. Y. Pharos



No. 686½.

686½. Pocket Case, containing:

- 1 Compasses, 6 in., with straightening device and fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 650,
- 1 Hairspring Dividers with straightening device, 6 in., No. 648,
- 1 Ringhead Bow Dividers, 3¾ in., with central thumbscrew, No. 665,
- 1 Ringhead Bow Pen, 3¾ in., with central thumbscrew No. 666,
- 1 Ringhead Bow Pencil, 3¾ in., with central thumbscrew No. 667,
- 1 Detail Pen, 6 in., upper blade with spring, No. 677,
- 1 Paragon WYTETIP "R" Drawing Pen, 5½ in., upper blade with spring, No. 524R,
- 1 Extra Handle, 3 in., for Compasses Pen,
- 1 Horn center, nickel silver rim, ¾ in. dia., No. 2691,
- 1 Nickel Silver Box, with assorted leads, No. 659,
- 1 Screw-driver, with magazine in handle containing assorted Needle Points

For description of Paragon WYTETIP "R" pens, see page 101.

KEUFFEL & ESSER CO., NEW YORK

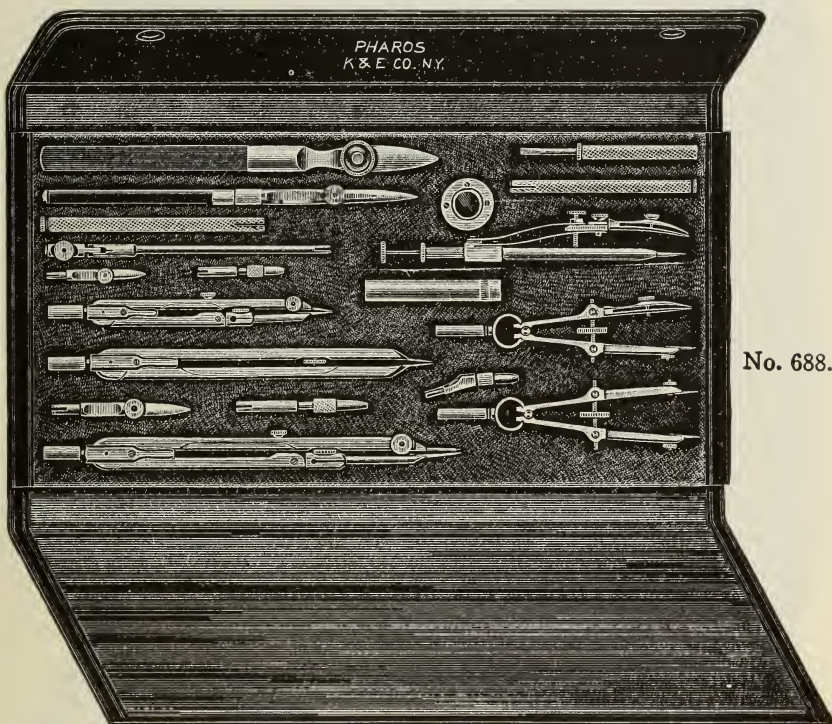
PHAROS

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

FLAT TYPE

Each Pharos instrument stamped KEUFFEL & ESSER CO., N. Y., or K & E Co. N. Y. Pharos.



No. 688.

688. Pocket Case, containing:

- 1 Hairspring Compasses, 6 in., with straightening device, and fixed Needle Point, Pen, Pencil Point, and Lengthening Bar No. 651,
- 1 Hairspring Compasses, 4 in., with straightening device, and fixed Needle Point, Pen, and Pencil, No. 643,
- 1 Hairspring Dividers with straightening device, 6 in., No. 648.
- 1 Ringhead Bow Dividers, $3\frac{3}{4}$ in., with central thumbscrew No. 665,
- 1 Ringhead Bow Pen, $3\frac{3}{4}$ in., with central thumbscrew No. 666,
- 1 Drop Spring Bow Pen and Pencil, 4 in., No. 664,
- 1 Detail Pen, 6 in., upper blade with spring, No. 677,
- 1 Paragon WYTETIP "R" Drawing Pen, $5\frac{1}{2}$ in., upper blade with spring, No. 524R,
- 1 Extra Handle 3 in., for large Compasses Pen,
- 1 Extra Handle, $2\frac{1}{2}$ in., for small Compasses Pen,
- 1 Horn center, nickel silver rim, $\frac{3}{4}$ in. dia., No. 2691,
- 1 Nickel Silver Box, with assorted leads, No. 659,
- 1 Screw-driver, with magazine in handle, containing assorted Needle Points.....set

For description of Paragon WYTETIP "R" pens, see page 101.

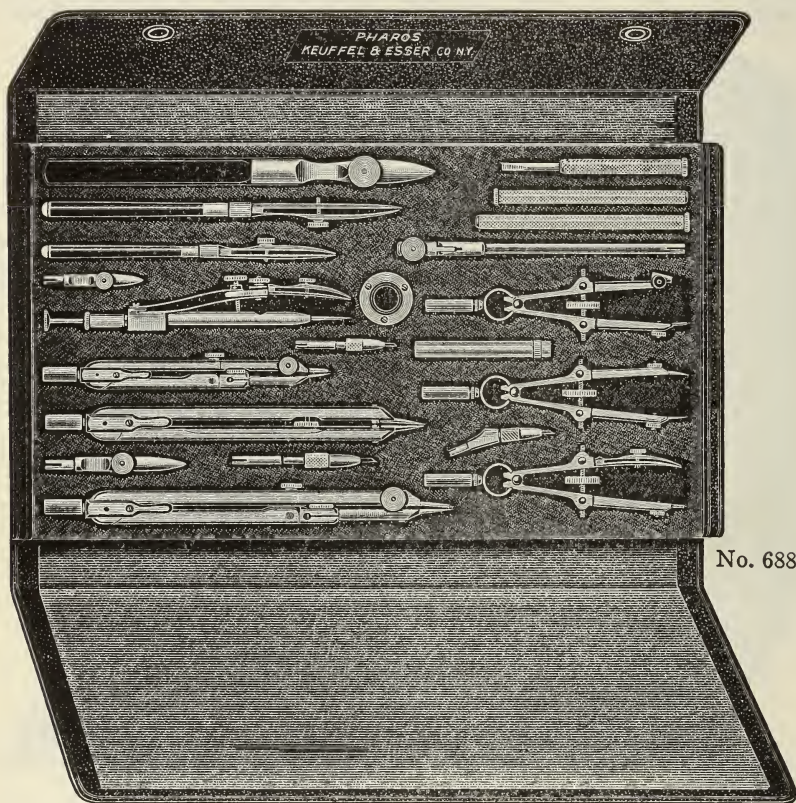
KEUFFEL & ESSER CO., NEW YORK

PHAROS

REG. U. S. PAT. OFF.

DRAWING INSTRUMENTS.

Each Pharos instrument stamped KEUFFEL & ESSER CO., N. Y., or K & E CO., N. Y., Pharos.



No. 688½

688½. Pocket Case, containing:—

- 1 Hairspring Compasses, 6 in., with straightening device, and fixed Needle Point, Pencil Point and Lengthening Bar, No. 651,
- 1 Hairspring Compasses, 4 in., with straightening device, and fixed Needle Point, Pen, and Pencil, No. 643,
- 1 Hairspring Dividers, with straightening device, 6 in., No. 648,
- 1 Ringhead Bow Dividers, 3½ in., with central thumbscrew, No. 665,
- 1 Ringhead Bow Pen, 3¼ in., with central thumbscrew, No. 666,
- 1 Ringhead Bow Pencil, 3¼ in., with central thumbscrew, No. 667,
- 1 Drop Spring Bow Pen and Pencil, 4 in., No. 664,
- 1 Detail Pen, 6 in., upper blade with spring, No. 677,
- 1 Paragon WYTETIP "R" Drawing Pen, 5½ in., upper blade with spring, No. 524R,
- 1 Paragon WYTETIP "R" Drawing Pen, 4½ in., upper blade with spring, No. 522R,
- 1 Extra Handle, 3 in., for large Compasses Pen,
- 1 Extra Handle, 2½ in., for small Compasses Pen,
- 1 Horn Center, nickel silver rim, ¾ in. dia., No. 2691.
- 1 Nickel Silver Box, with assorted leads, No. 659,
- 1 Screw-driver, with magazine in handle, with assorted Needle Points . . . set




KEY
TRADE MARK

DRAWING INSTRUMENTS.

SQUARE TYPE

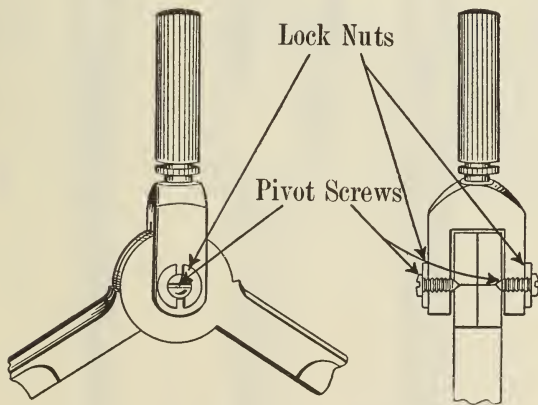


REG. U. S. PAT. OFF.

Each instrument stamped KEUFFEL & ESSER CO., or K & E CO., N. Y. 

Key Instruments are of very high quality; and meet the specifications of the U. S. Government for first grade drawing instruments. They are made from hard rolled nickel silver and fine steel by skilled workmen. The workmanship and finish fully satisfy the requirements of the professional draftsman who is not prepared to purchase Paragon Instruments. The threads of all screws are precisely cut; the movable joints are accurately made, giving smooth and even motion; and all insertion pieces are perfectly fitted.

Compasses and Dividers. The heads have pivot joints with steel locknuts, as shown in the illustrations. The advantages of this type of head construction are, that it combines simplicity and durability with handsome appearance.



The knee joints of the compasses are provided with steel plates, which reduce wear and friction and promote smoothness of operation.

Steelspring Bows. These are of the well known steelspring or Paragon type; carefully designed, well balanced, and handsomely finished. Key Steelspring Bows with Side adjusting screw and Steelspring Bows with Central Thumbscrew are carried.

Drawing Pens. The pens now furnished with the Key sets are those formerly furnished in the Paragon line; and consequently are the very highest quality carbon steel pens. They are so well known that they require no further description.

Cases. These are of the best material and workmanship. They are covered with Morocco finish leather and lined with highgrade Velvet.

KEUFFEL & ESSER CO., NEW YORK

KEY

TRADE MARK

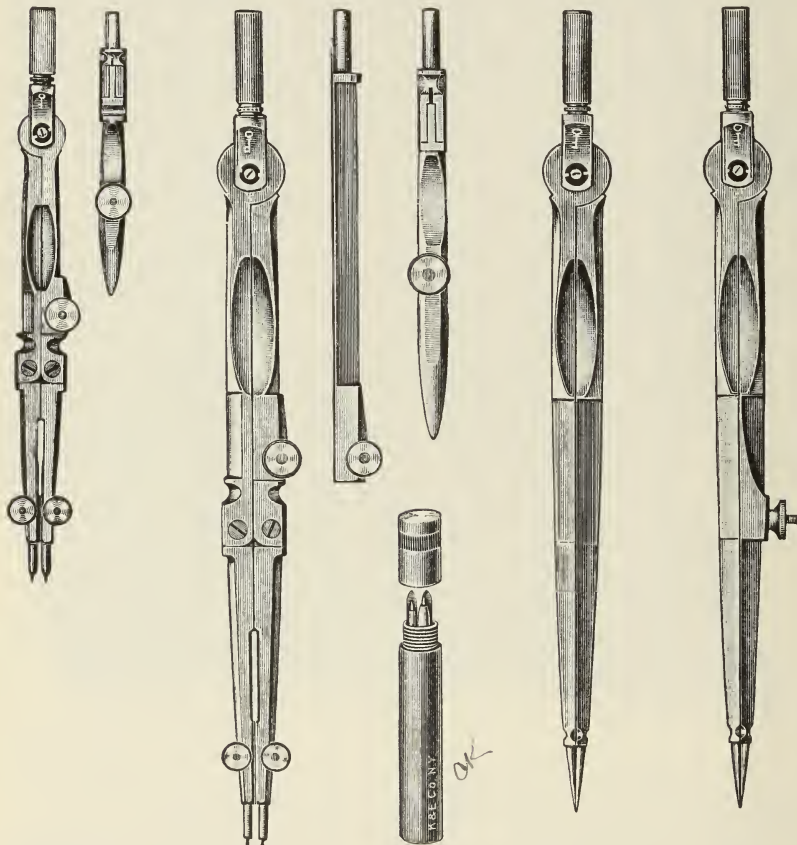
DRAWING INSTRUMENTS

SQUARE TYPE



REG. U. S. PAT. OFF.

Each instrument stamped KEUFFEL & ESSER CO., or K & E CO., N. Y. 



No. N843.

N850.

N 859.

N846.

N848.

- N 843. Compasses, $4\frac{1}{2}$ in., fixed Needle Point, Pen, and Pencil Point, 2 Shouldered Needles.....each
- N 850. Compasses, $6\frac{1}{4}$ in., fixed Needle Point, Pen Point with spring blade, Pencil Point, Lengthening Bar, 2 Shouldered Needles.....“
- N 851. Compasses, like N 850, but with hairspring.....“
- N 859. Nickel Silver Box, with leads.....“
- N 846. Plain Dividers, 6 in.....“
- N 848. Hairspring Dividers, 6 in.....“



KEY


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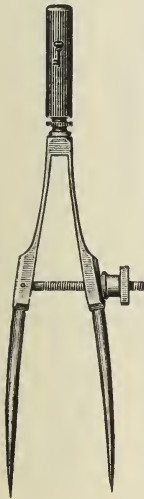
DRAWING INSTRUMENTS

SQUARE TYPE

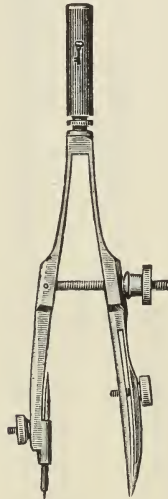


REG. U. S. PAT. OFF.

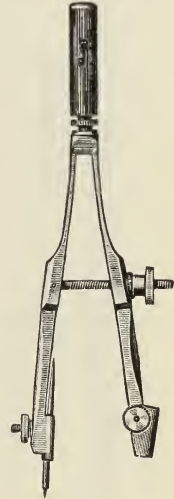
Each instrument stamped KEUFFEL & ESSER CO., or K & E CO., N. Y. 



No. N860.



N861.



N862.

N 860. Steelspring Bow Dividers, $3\frac{1}{2}$ in., nickel silver Handle.....each

N 861. Steelspring Bow Pen, $3\frac{1}{2}$ in., with Spring Blade and Needle Point, nickel silver Handle..... “

N 862. Steelspring Bow Pencil, $3\frac{1}{2}$ in., with Needle Point, nickel silver Handle..... “



KEY


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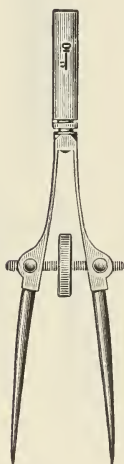
DRAWING INSTRUMENTS

SQUARE TYPE

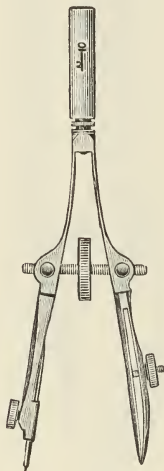


REG. U. S. PAT. OFF.

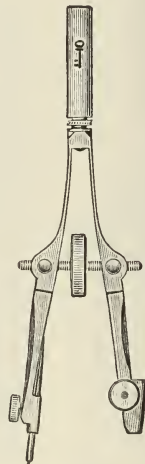
Each Instrument stamped KEUFFEL & ESSER CO., or K & E CO., N. Y. 



No. N865.



N866.



N867.

N 865. Steelspring Bow Dividers, with central thumbscrew, nickel silver Handle, $3\frac{1}{2}$ in.....each

N 866. Steelspring Bow Pen, with central thumbscrew, nickel silver Handle, $3\frac{1}{2}$ in..... “

N 867. Steelspring Bow Pencil, with central thumbscrew, nickel silver Handle, $3\frac{1}{2}$ in..... “




KEY
TRADE MARK

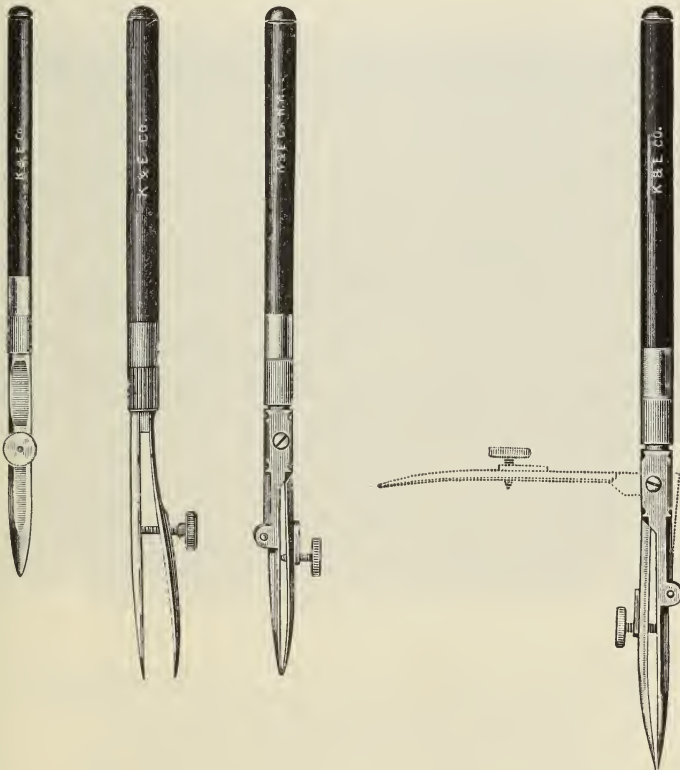
DRAWING INSTRUMENTS

SQUARE TYPE



REG. U. S. PAT. OFF.

Each Instrument stamped KEUFFEL & ESSER CO., or K & E CO., N. Y. 



No. 872.

873.

873K

874K

872.	Drawing Pen, upper blade with spring, $4\frac{1}{2}$ in.	each
873.	" " " " " " 5 "	"
874.	" " " " " " $5\frac{1}{2}$ "	"
872K.	Knife Spring Drawing Pen, $4\frac{1}{2}$ in.	"
873K.	" " " " " 5 "	"
874K.	" " " " " $5\frac{1}{2}$ "	"

The Knife Spring Key Pens have a hinged upper blade actuated by a spring similar to a pocket knife, which either holds the pen open at 90 degrees or presses it firmly against the fixed blade (See page 102.)



KEY
TRADE MARK

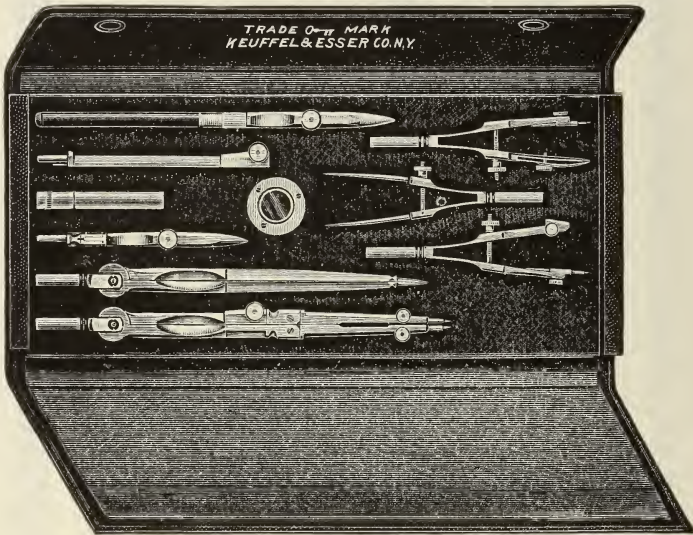
DRAWING INSTRUMENTS.

SQUARE TYPE



REG. U. S. PAT. OFF.

Each instrument stamped KEUFFEL & ESSER CO., or K & E CO., N. Y. 



No. 895½.

895½. Pocket Case containing:-

- 1 Compasses, 6½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. N 850.
- 1 Plain Dividers, 6 in., No. N 846.
- 1 Steelspring Bow Dividers, 3½ in., No. N 860.
- 1 Steelspring Bow Pen, 3½ in., No. N 861.
- 1 Steelspring Bow Pencil, 3½ in., No. N 862.
- 1 Drawing Pen, 5½ in., upper blade with spring, No. 874.
- 1 Horn Center, nickel silver rim, ¾ in. dia., No. 2691,
- 1 Nickel silver Box with 3 Leads, No. 859. set

895½C. Pocket Case, containing same assortment as No. 895½, but with Spring Bows Nos. N 865, N 866, and N 867 (central thumbscrew) in place of Nos. N 860, N 861, and N 862.. set




KEY
TRADE MARK

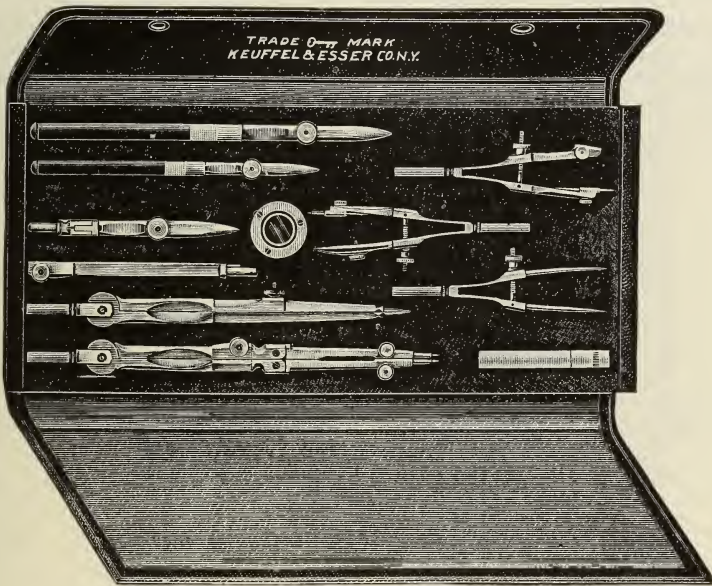
DRAWING INSTRUMENTS.

SQUARE TYPE



REG. U. S. PAT. OFF.

Each instrument stamped KEUFFEL & ESSER CO., or K & E CO., N. Y. 



No. 896.

896. Pocket Case containing:-

- 1 Compasses, $6\frac{1}{2}$ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. N 850.
- 1 Hairspring Dividers, 6 in., No. N 848.
- 1 Steelspring Bow Dividers, $3\frac{1}{2}$ in., No. N 860.
- 1 Steelspring Bow Pen, $3\frac{1}{2}$ in., No. N 861.
- 1 Steelspring Bow Pencil, $3\frac{1}{2}$ in., No. N 862.
- 1 Drawing Pen, $4\frac{1}{2}$ in., upper blade with spring, No. 872.
- 1 Drawing Pen, $5\frac{1}{2}$ in., " " No. 874.
- 1 Horn Center, nickel silver rim, $\frac{3}{4}$ in., dia., No. 2691,
- 1 Nickel silver Box with 3 Leads, No. 859. set

896C. Pocket Case, containing same assortment as No. 896, but with Spring Bows Nos. N 865, N 866, and N 867 (central thumbscrew) in place of Nos. N 860, N 861 and N 862. set

KEUFFEL & ESSER CO., NEW YORK

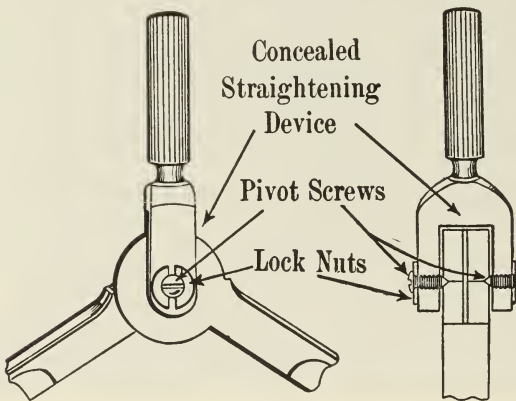
ANVIL
TRADE MARK

DRAWING INSTRUMENTS.

SQUARE TYPE

ANVIL Instruments are designed to meet the requirements of the large number of non-professional users, including students, who are in need of durable and serviceable instruments at a moderate price. These instruments are made of hard rolled nickel silver and fine steel, and are well finished and fitted.

Compasses and Dividers. The heads have pivot joints with lock nuts as shown in the illustration. The advantages of this type of head construction are, that it combines simplicity and durability with handsome appearance. These instruments, with the exception of No. 943, are fitted with a simple and durable straightening device.



The knee joints of the compasses are fitted with steel plates, which reduce wear and friction and promote smoothness of operation.

Steelspring Bows. These are of the steelspring type; well finished and durable. Anvil Steelspring Bows with Side adjusting screw and with Central thumbscrew are carried.

Drawing Pens. These are of the superior hexagonal type. The points are carefully ground to the form demanded by expert draftsmen, tempered to the proper degree of hardness, and finely sharpened. They are the pens that were formerly furnished as Key Drawing Pens.

Miscellaneous Instruments. The Detail Pen, Beam Compasses, Proportional Dividers and Drop Bow Instruments included in this line are equal in quality to the other instruments described above.

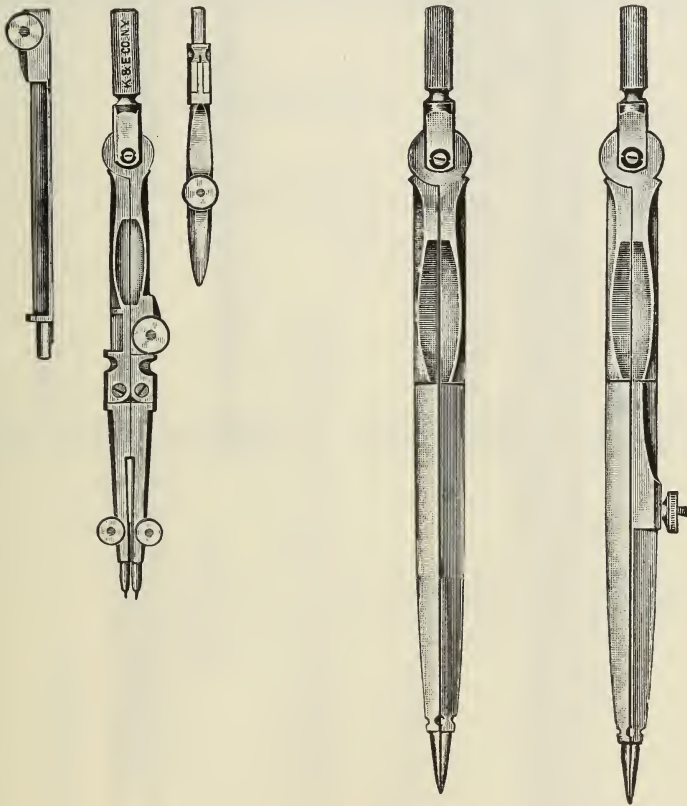
Cases. These are very well made, covered with high quality imitation leather, and velvet lined.



ANVIL
TRADE MARK

DRAWING INSTRUMENTS.

SQUARE TYPE



No. 943.

946.

948.

943. Compasses, $4\frac{3}{8}$ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar.....each

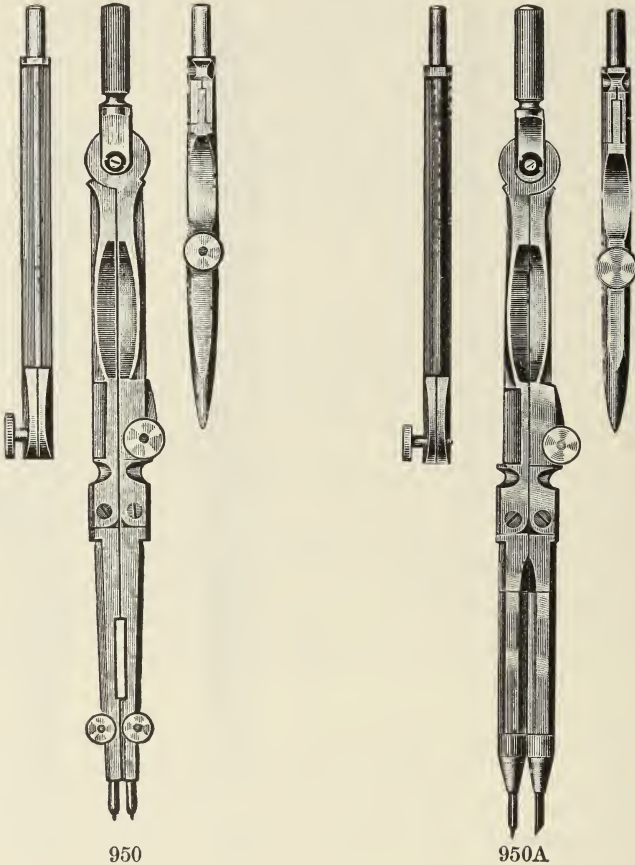
946. Plain Dividers, with straightening device, 6 in..... “

948. Hairspring Dividers, with straightening device, 6 in..... “

KEUFFEL & ESSER CO., NEW YORK

ANVIL
TRADE MARK
DRAWING INSTRUMENTS

SQUARE TYPE



950. Compasses, $6\frac{1}{4}$ in. with straightening device, fixed Needle Point, Pen, Pencil Point and Lengthening Bar each

950A. Compasses, $6\frac{1}{4}$ in., similar to No. 950, but with patent adjusting device for the needle and pencil points. “

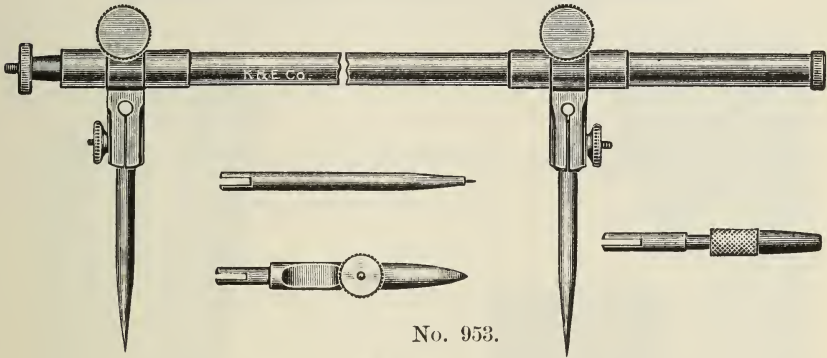
On No. 950A the needle and pencil points are adjustable to length by rotating the collars which, in turn, can be locked in position by means of nuts. This design forms a quick and efficient method for bringing the needle and lead into correct relationship. (See page 98).



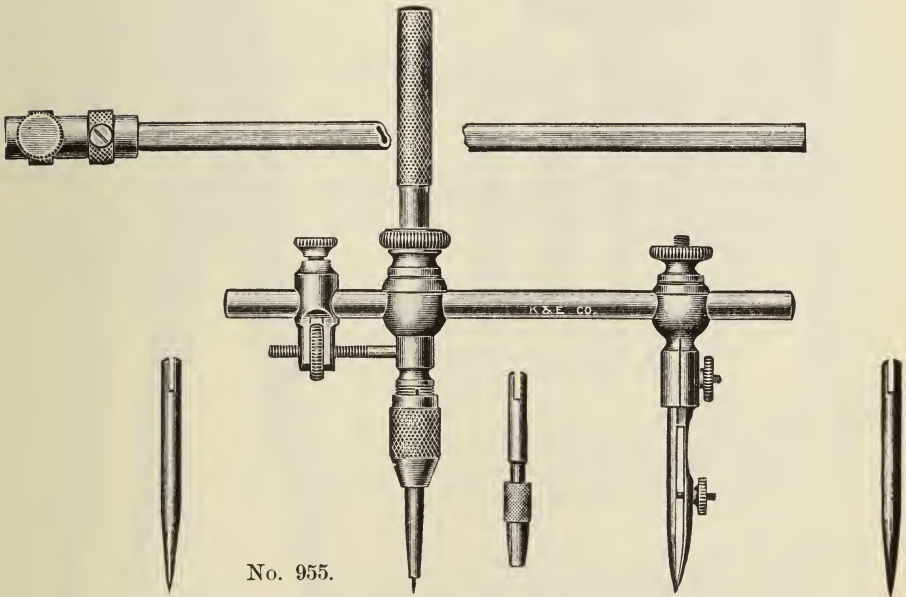
ANVIL

TRADE MARK

DRAWING INSTRUMENTS.



No. 953.



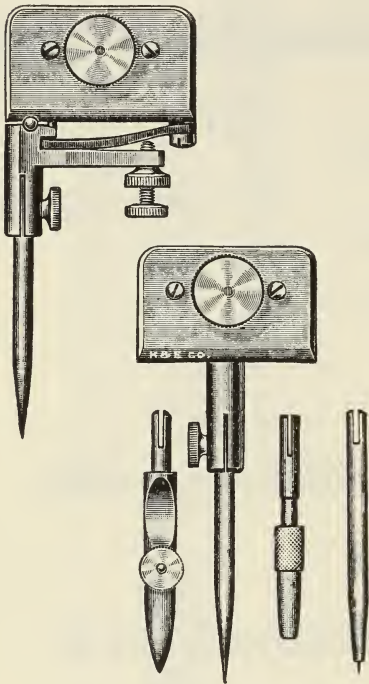
No. 955.

- 953. Tubular Beam Compasses, 24 in., 2 round nickel silver Bars,
2 Steel Points, Pen, Pencil and Needle Point, Micro-
meter Adjustment each
- 953C. Tubular Beam Compasses No. 953 in leatherette covered case,
velvet lined “
- 955. Tubular Beam Compasses, 16½ in., 2 round nickel silver Bars,
one bar 4 in., one bar 13 in. with collar, 2 Steel Points,
Pen, Pencil and Needle Point, Micrometer Adjustment “
- 955C. Tubular Beam Compasses No. 955 in leatherette covered case,
velvet lined “
- Extra Bar, 13 in., with collar and thumb screw “



ANVIL
TRADE MARK

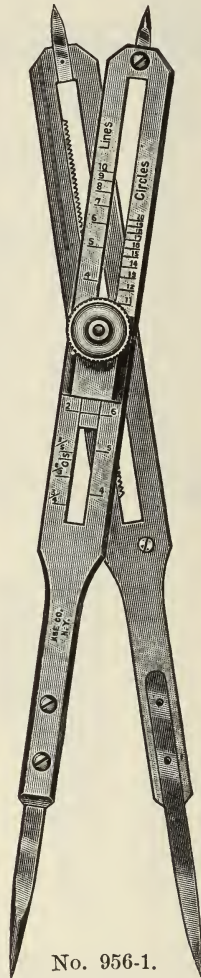
DRAWING INSTRUMENTS.



No. 954.

954. Beam Compasses, to fit on bar or straightedge, with Pen (Spring blade), Pencil, 3 Needle Points and Micrometer Adjustment... each

954C. Beam Compasses No. 954 in imitation leather covered case with velvet lining “



No. 956-1.

956-1. Proportional Dividers, $7\frac{1}{2}$ in., divided for lines (from $\frac{3}{4}$ to 10) and circles* (from 4 to 20), with Rack Movement which greatly facilitates setting each

956-1C. Proportional Dividers, No. 956-1 in imitation leather covered case with velvet lining, “

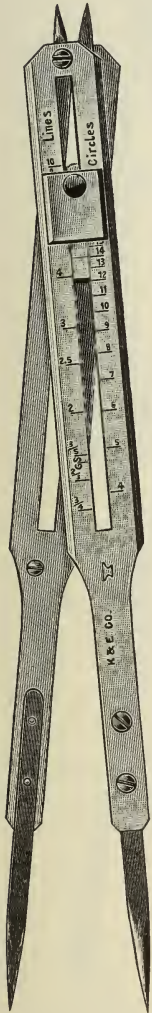
No. 956-1 has replaceable steel points which enables it to be readily repaired.

KEUFFEL & ESSER CO., NEW YORK

ANVIL

TRADE MARK

DRAWING INSTRUMENTS.



No. 956-2

956-2. Proportional Dividers, $7\frac{1}{2}$ in., divided for lines (from $\frac{3}{4}$ to 10) and circles* (from 4 to 20) each

956-2C. Proportional Dividers, No. 956-2, in imitation leather covered case with velvet lining, each

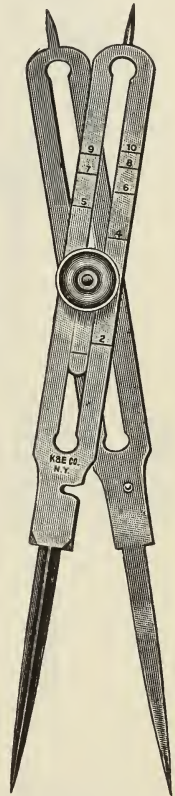
956-3. Proportional Dividers, $7\frac{1}{2}$ in., divided for lines (from $\frac{3}{4}$ to 10) . . . each

956-3C. Proportional Dividers, No. 956-3, in imitation leather covered case with velvet lining, each

Anvil Proportional Dividers Nos. 956-1, -2 and -3 have replaceable steel points which enable them to be readily repaired.

957. Proportional Dividers, 6 in., divided for lines (from 2 to 10) . . . each

957C. Proportional Dividers, No. 957, in imitation leather covered case . each

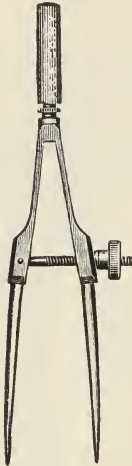


No. 957

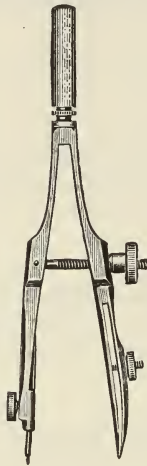
* The scale of circles provides a means by which the circumference of any circle within the scope of the instrument can be rapidly divided into from 4 to 20 equal parts.



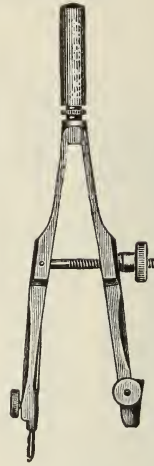
ANVIL
TRADE MARK
DRAWING INSTRUMENTS.
SQUARE TYPE



No. 960.

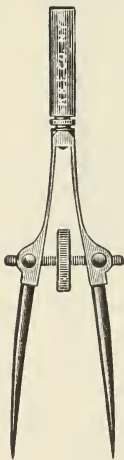


961.

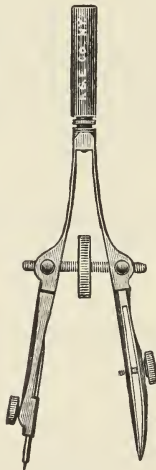


962.

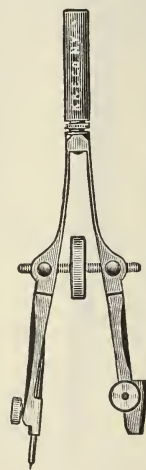
- | | |
|------|---|
| 960. | Steelspring Bow Dividers, $3\frac{1}{2}$ in., nickel silver Handle.....each |
| 961. | Steelspring Bow Pen, $3\frac{1}{2}$ in., with spring blade and needle point, nickel silver Handle.....“ |
| 962. | Steelspring Bow Pencil, $3\frac{1}{2}$ in., with needle point, nickel silver Handle.....“ |



No. 965.



966.

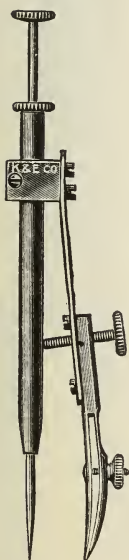


967.

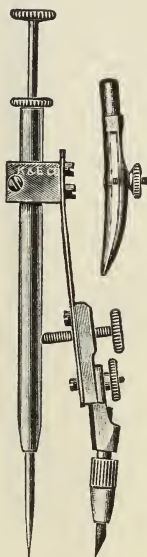
- | | |
|------|---|
| 965. | Steelspring Bow Dividers, $3\frac{1}{2}$ in. with central thumbscrew, nickel silver Handle.....each |
| 966. | Steelspring Bow Pen, $3\frac{1}{2}$ in. with spring blade and with central thumbscrew, nickel silver Handle.....“ |
| 967. | Steelspring Bow Pencil, $3\frac{1}{2}$ in. with central thumbscrew, nickel silver Handle.....“ |



ANVIL
TRADE MARK
DRAWING INSTRUMENTS.
SQUARE TYPE



No. 963.



No. 964.



No. 970.

963. Drop Bow Pen, with spring blade, 4 in., each

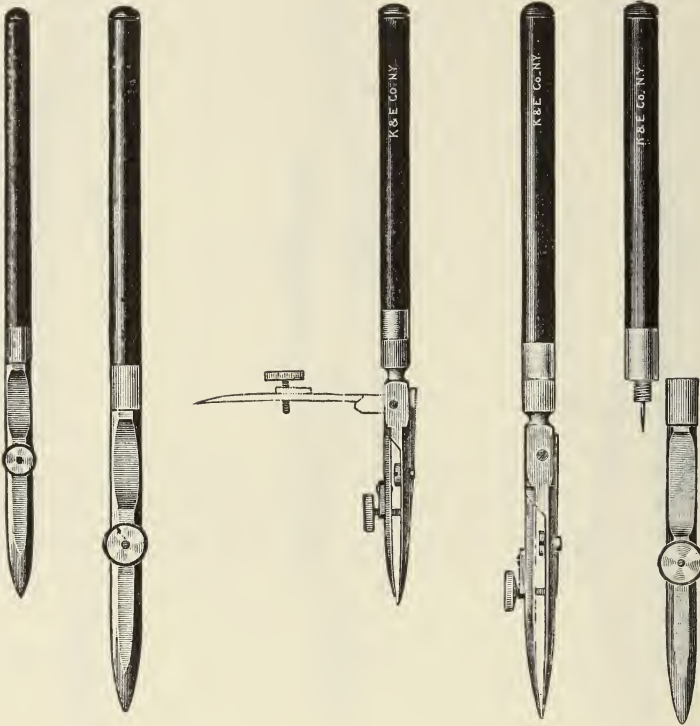
964. Drop Bow Pen and Pencil, pen with spring blade, 4 in., “

970. Pricker, 4 in. overall, with replaceable needle point 1 in. long;
hollow metal handle with screw cap to hold extra needle points. “



ANVIL
TRADE MARK

DRAWING INSTRUMENTS.



No. N972 N974 N972K N974K N975

- N972. Drawing Pen, upper blade with spring, $4\frac{1}{2}$ in., each
 N974. Drawing Pen, upper blade with spring, $5\frac{1}{2}$ in., "
 N972K. Knife Spring Drawing Pen, $4\frac{1}{2}$ in. "
 N974K. " " " " $5\frac{1}{2}$ in. "

The Knife Spring Anvil Pens have a hinged upper blade actuated by a spring similar to a pocket knife, which either holds the pen open at 90 degrees or presses it firmly against the fixed blade (see page 102).

- N975. Drawing Pen, upper blade with spring, $5\frac{1}{2}$ in., detachable
 handle with Pricker Point. each



ANVIL
TRADE MARK

DRAWING INSTRUMENTS



No. 976-1



No. 976-2



No. 977

976-1. Improved Curve Pen, $4\frac{3}{4}$ in. , spring blade,..... each

This pen has a hollow handle in which a thin rod rotates. The blades being fastened to the end of the rod and being eccentric to it, turn easily and follow the smallest curve with precision. By means of a nut at the upper end of the rod, the pen can be clamped and may then be used as a regular drawing pen.

976-2. Improved Railroad Pen, $5\frac{1}{4}$ in., spring blades..... each

The construction of this pen is like that of No. 976-1 with the exception that it has two pairs of blades.

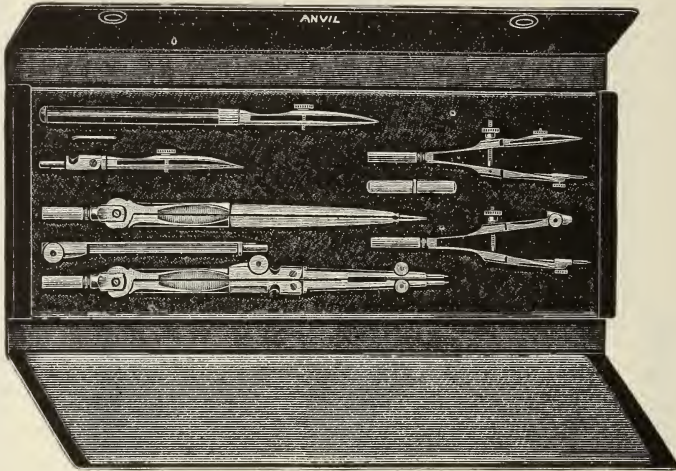
977. Detail Drawing Pen, $5\frac{7}{8}$ in., upper blade with spring, flat wood handle,.....each



ANVIL
TRADE MARK

DRAWING INSTRUMENTS.

SQUARE TYPE



No. N994 $\frac{1}{2}$.

N990. Pocket Case containing:—

- 1 Compasses, 6 $\frac{1}{4}$ in. with straightening device, and fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 950,
- 1 Drawing Pen, 5 $\frac{1}{2}$ in., upper blade with spring No. N974,
- 1 Nickel Silver Box with Leads and Needle Points.... set

N994 $\frac{1}{2}$. Pocket Case, containing:—

- 1 Compasses, 6 $\frac{1}{4}$ in. with straightening device, and fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 950,
- 1 Plain Dividers with straightening device, 6 in., No. 946,
- 1 Steelspring Bow Pen, 3 $\frac{1}{2}$ in., No. 961,
- 1 Steelspring Bow Pencil, 3 $\frac{1}{2}$ in., No. 962,
- 1 Drawing Pen, 5 $\frac{1}{2}$ in., upper blade with spring, No. N974,
- 1 Nickel Silver Box with Leads and Needle Points..... set

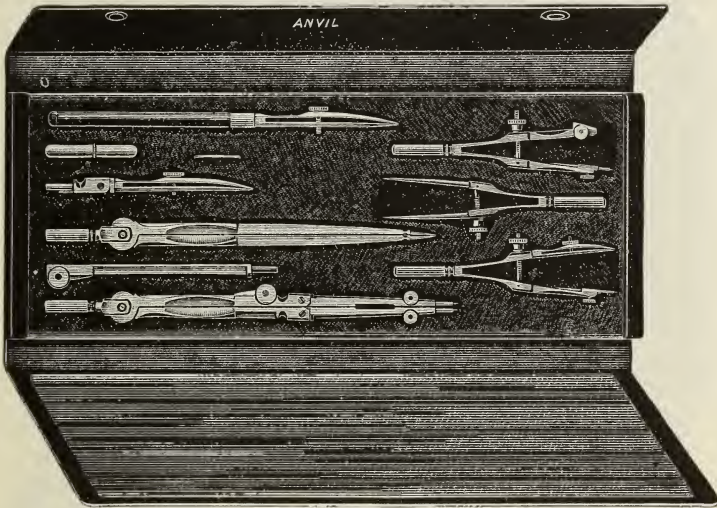
N994 $\frac{1}{2}$ C. Pocket Case, containing same assortment as No. N994 $\frac{1}{2}$, but with Spring Bows Nos. 966 and 967 (central thumb-screw) in place of Nos. 961 and 962 set



ANVIL
TRADE MARK

DRAWING INSTRUMENTS.

SQUARE TYPE



No. N995 $\frac{1}{2}$.

N995 $\frac{1}{2}$. Pocket Case, containing:—

- 1 Compasses, 6 $\frac{1}{4}$ in., with straightening device, and fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 950,
- 1 Plain Dividers with straightening device, 6 in., No. 946,
- 1 Steelspring Bow Dividers, 3 $\frac{1}{2}$ in., No. 960,
- 1 Steelspring Bow Pen, 3 $\frac{1}{4}$ in., No. 961,
- 1 Steelspring Bow Pencil, 3 $\frac{1}{2}$ in., No. 962,
- 1 Drawing Pen, 5 $\frac{1}{2}$ in., upper blade with spring, No. N 974,
- 1 Nickel Silver Box with Leads and Needle Points. . . . set

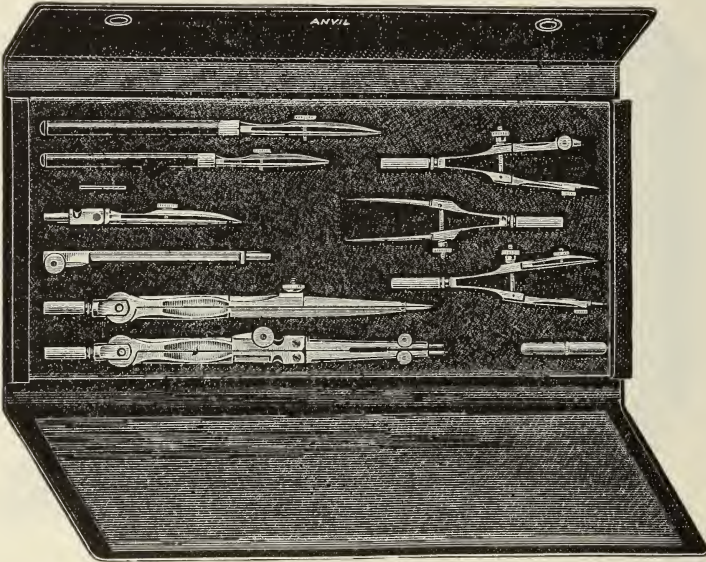
**N995 $\frac{1}{2}$ C. Pocket Case, containing same assortment as No. N995 $\frac{1}{2}$,
but with Spring Bows Nos. 965, 966 and 967
(central thumbscrew) in place of Nos. 960, 961 and 962. set**

KEUFFEL & ESSER CO., NEW YORK

ANVIL
TRADE MARK

DRAWING INSTRUMENTS.

SQUARE TYPE



No. N996.

N996. Pocket Case, containing:-

- 1 Compasses, $6\frac{1}{4}$ in., with straightening device, and fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 950,
- 1 Hairspring Dividers with straightening device, 6 in., No. 948,
- 1 Steelspring Bow Dividers, $3\frac{1}{2}$ in., No. 960,
- 1 Steelspring Bow Pen, $3\frac{1}{2}$ in., No. 961,
- 1 Steelspring Bow Pencil, $3\frac{1}{2}$ in., No. 962,
- 1 Drawing Pen, $4\frac{1}{2}$ in., upper blade with spring, No. N972,
- 1 Drawing Pen, $5\frac{1}{2}$ in., upper blade with spring, No. N974,
- 1 Nickel Silver Box with Leads and Needle Points set

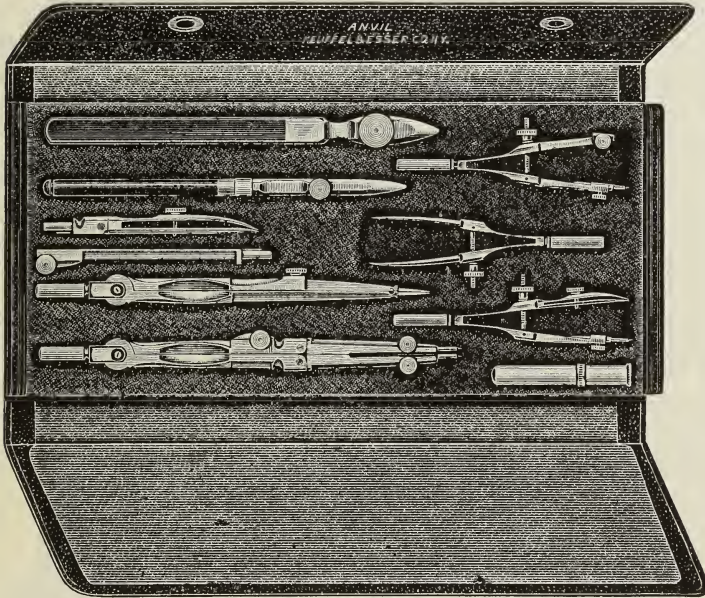
N996C. Pocket Case, containing same assortment as No. N996, but with Spring Bows Nos. 965, 966 and 967 (central thumb-screw) in place of Nos. 960, 961 and 962 set

KEUFFEL & ESSER CO., NEW YORK

ANVIL
TRADE MARK

DRAWING INSTRUMENTS.

SQUARE TYPE



No. N996 $\frac{1}{2}$.

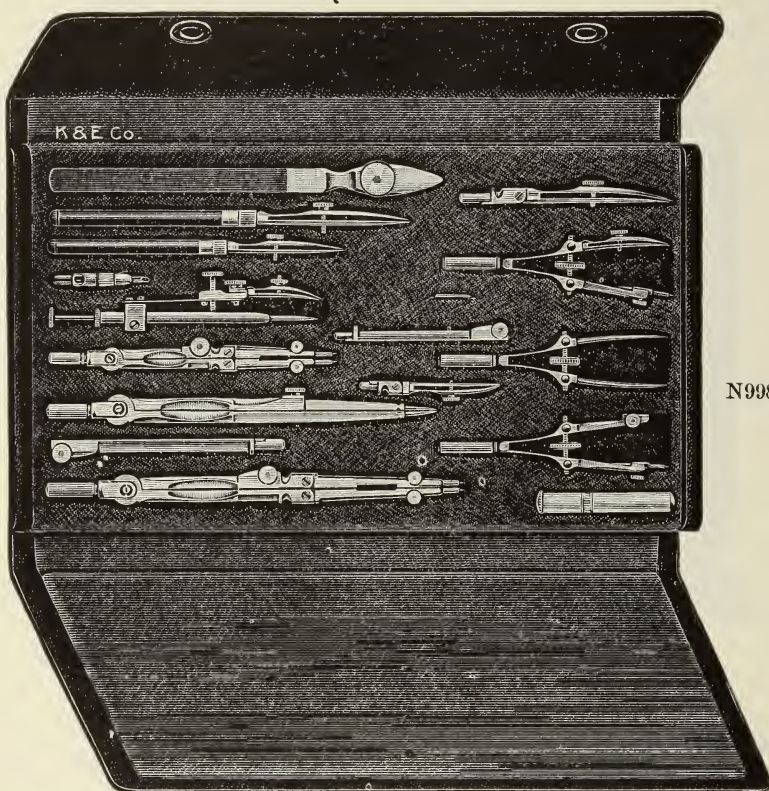
N996 $\frac{1}{2}$. Pocket Case, containing:—

- 1 Compasses, 6 $\frac{1}{4}$ in., with straightening device, and fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 950,
- 1 Hairspring Dividers with straightening device, 6 in., No. 948,
- 1 Steelspring Bow Dividers, 3 $\frac{1}{2}$ in., No. 960,
- 1 Steelspring Bow Pen, 3 $\frac{1}{2}$ in., No. 961,
- 1 Steelspring Bow Pencil, 3 $\frac{1}{2}$ in., No. 962,
- 1 Drawing Pen, 5 $\frac{1}{2}$ in., upper blade with spring, No. N 974,
- 1 Detail Drawing Pen, 5 $\frac{1}{8}$ in., upper blade with spring, No. 977,
- 1 Nickel Silver Box with Leads and Needle Points. . . . set

N996 $\frac{1}{2}$ C. Pocket Case, containing same assortment as No. N 996 $\frac{1}{2}$, but with Spring Bows Nos. 965, 966 and 967 (central thumbscrew) in place of Nos. 960, 961 and 962. “

KEUFFEL & ESSER CO., NEW YORK

ANVIL
TRADE MARK
DRAWING INSTRUMENTS.
SQUARE TYPE



N998 $\frac{1}{2}$ C

- N998 $\frac{1}{2}$.** Pocket Case, containing:
- 1 Compasses, 6 $\frac{1}{2}$ in., with straightening device, and fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 950,
 - 1 Compasses, 4 $\frac{3}{4}$ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 943,
 - 1 Hairspring Dividers, with straightening device, 6 in., No. 948,
 - 1 Steelspring Bow Dividers, 3 $\frac{1}{2}$ in., No. 960,
 - 1 Steelspring Bow Pen, 3 $\frac{1}{2}$ in., No. 961,
 - 1 Steelspring Bow Pencil, 3 $\frac{1}{2}$ in., No. 962,
 - 1 Drop Bow Pen and Pencil, 4 in., No. 964,
 - 1 Detail Drawing Pen, 5 $\frac{7}{8}$ in., upper blade with spring, No. 977,
 - 1 Drawing Pen, 4 $\frac{1}{2}$ in., upper blade with spring, No. N972,
 - 1 Drawing Pen, 5 $\frac{1}{2}$ in., upper blade with spring, No. N974,
 - 1 Nickel Silver Box with Leads and Needle Points..... set
- N998 $\frac{1}{2}$ C.** Pocket Case, containing same assortment as No. N998 $\frac{1}{2}$, but with Spring Bows Nos. 965, 966, and 967 (central thumb-screw) in place of Nos. 960, 961 and 962..... set

KEUFFEL & ESSER CO., NEW YORK

SPECIAL ARROW

TRADE MARK

DRAWING INSTRUMENTS

FLAT TYPE

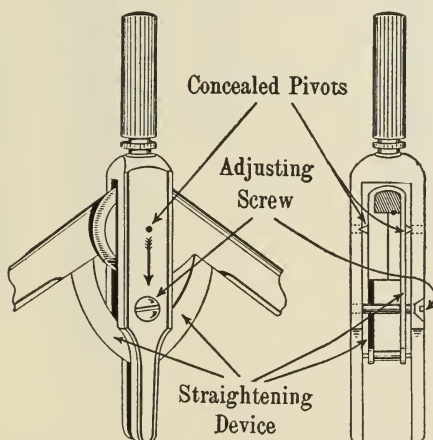


TRADE MARK

SPECIAL ARROW Instruments are intended to meet the requirements of the professional draftsman who desires good, serviceable instruments at a moderate price. They are of the same general construction as the Pharos, although somewhat lighter in weight; and are made of rolled nickel silver and fine steel.

These instruments are of the Flat Type, which lends itself to machine production. This method of manufacturing has been carried further with **Special Arrow** than with **Pharos Instruments**. Hence, since less hand work has entered into the manufacture of **Special Arrow Instruments**, they do not possess the extremely high quality of **Pharos**; but despite their relatively low price they are of **equal grade** to most of the flat type instruments offered by others at higher prices.

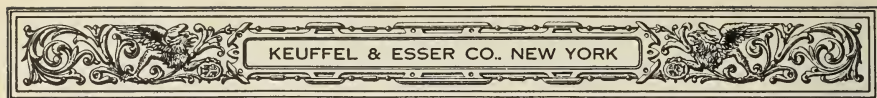
Compasses and Dividers. Both instruments have heads with concealed pivot joints, which are easily adjusted, without direct action upon the pivots themselves, to maintain the correct relation between the friction of the various parts. The Straightening device is of the same construction as the **Pharos**.



Bow Instruments. These accord in quality with the other instruments of the line. They are sturdy and very well made, of the ringhead type and with central thumbscrews.

Drawing Pens. **Special Arrow Drawing Pens** are of octagonal shape and of a quality usually found in much higher priced instruments. The steel is carefully tempered and the points correctly shaped and finely sharpened.

Cases. They are very well made, covered with high quality imitation leather, and lined with silk velvet.



SPECIAL ARROW

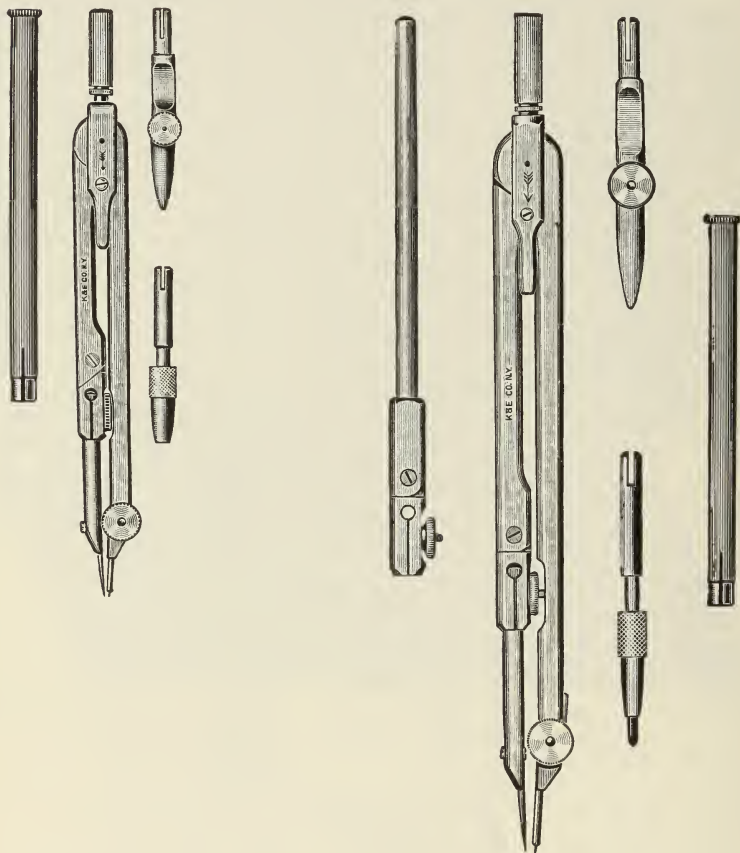
TRADE MARK

DRAWING INSTRUMENTS.

FLAT TYPE



TRADE MARK



No. E 1043.

No. E 1050.

E1043. Compasses, $4\frac{1}{2}$ in., with straightening device, and fixed Needle Point, Pen, Pencil Point, Lengthening Bar, and Extra Handle to convert pen to ruling pen.....each

E1050. Compasses, $6\frac{1}{4}$ in., with straightening device, and fixed Needle Point, Pen, Pencil Point, Lengthening Bar, and Extra Handle to convert pen to ruling pen, “

1059. Box with 3 Leads “ *6K*

KEUFFEL & ESSER CO., NEW YORK

SPECIAL ARROW

TRADE MARK

DRAWING INSTRUMENTS.

FLAT TYPE



TRADE MARK



No. E 1046.

No. E 1048.

No. E1074 $\frac{1}{2}$.

No. E1072 $\frac{1}{2}$.

E 1046. Plain Dividers, 6 in., with straightening deviceeach

E 1048. Hairspring Dividers, 6 in., with straightening device “

E1072 $\frac{1}{2}$. Drawing Pen, octagonal type, upper blade with spring, 4 $\frac{1}{2}$ in. “

E1074 $\frac{1}{2}$. Drawing Pen, octagonal type, upper blade with spring, 5 $\frac{1}{2}$ in. “

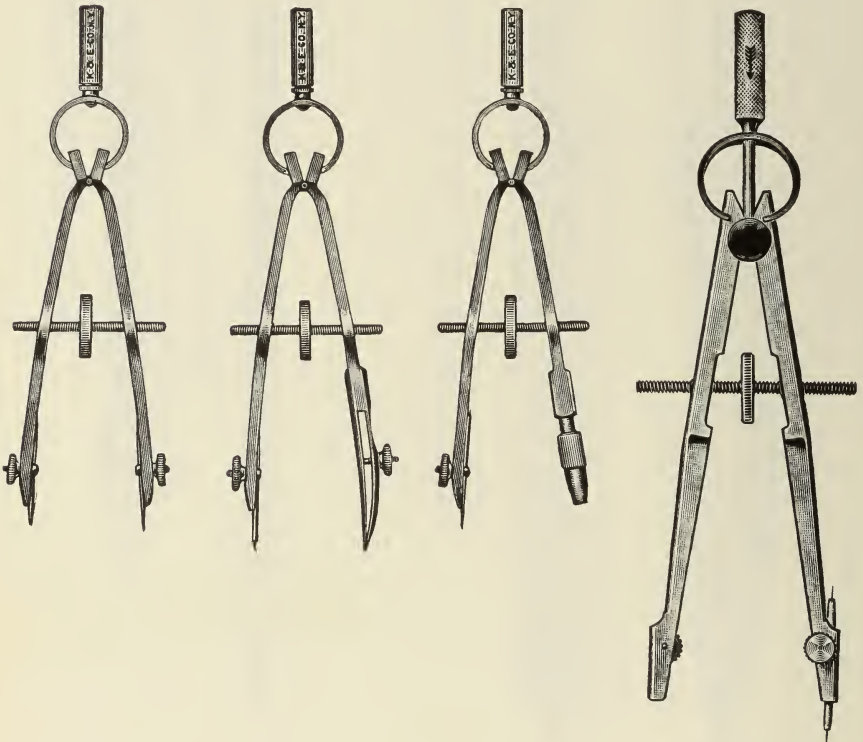
KEUFFEL & ESSER CO., NEW YORK

SPECIAL ARROW

TRADE MARK

DRAWING INSTRUMENTS

FLAT TYPE



No. E1065 $\frac{1}{2}$.

E1066 $\frac{1}{2}$.

E1067 $\frac{1}{2}$.

E1069.

- E1065 $\frac{1}{2}$. Ringhead Bow Dividers, 4 $\frac{1}{4}$ in., with central thumbscrew,
nickel silver Legs and Handleeach
- E1066 $\frac{1}{2}$. Ringhead Bow Pen, 4 $\frac{1}{4}$ in., with central thumbscrew,
nickel silver Legs and Handle “
- E1067 $\frac{1}{2}$. Ringhead Bow Pencil, 4 $\frac{1}{4}$ in., with central thumbscrew,
nickel silver Legs and Handle “
- E1069. Ringhead Bow Pencil, 5 $\frac{1}{2}$ in., with central thumbscrew,
nickel silver Legs and Handle “

KEUFFEL & ESSER CO., NEW YORK

SPECIAL ARROW

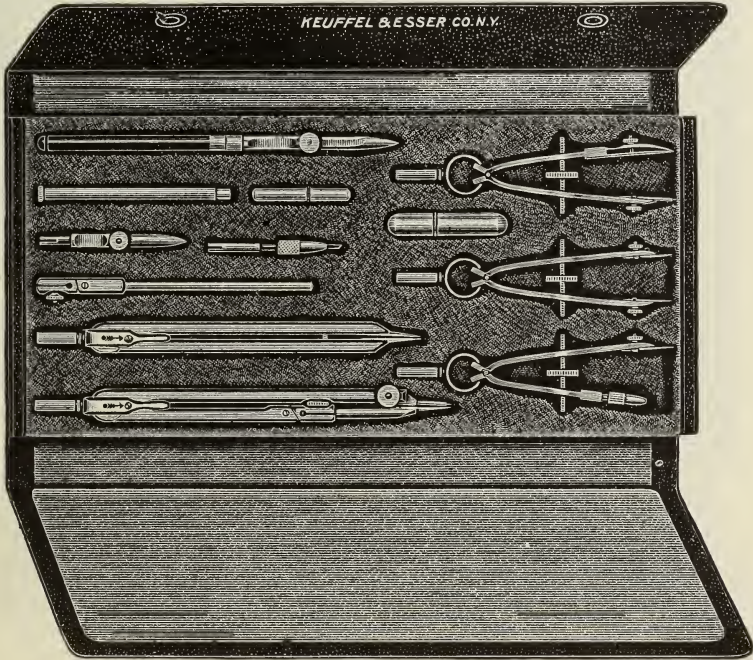
TRADE MARK

DRAWING INSTRUMENTS.

FLAT TYPE



TRADE MARK



No. NE 1085 $\frac{1}{2}$.

NE1085 $\frac{1}{2}$. Pocket Case containing:-

- 1 Compasses, 6 $\frac{1}{4}$ in., with straightening device, and fixed Needle Point, Pen, Pencil Point, Lengthening Bar, and Extra Handle to convert pen to ruling pen, No. E 1050,
- 1 Plain Dividers, with straightening device, 6 in., No. E 1046,
- 1 Ringhead Bow Dividers, 4 $\frac{1}{4}$ in., with central thumbscrew, No. E 1065 $\frac{1}{2}$,
- 1 Ringhead Bow Pen, 4 $\frac{1}{4}$ in., with central thumbscrew, No. E 1066 $\frac{1}{2}$,
- 1 Ringhead Bow Pencil, 4 $\frac{1}{4}$ in., with central thumbscrew, No. E 1067 $\frac{1}{2}$,
- 1 Drawing Pen, 5 $\frac{1}{2}$ in., upper blade with spring, No. E 1074 $\frac{1}{2}$.
- 1 Box with 3 Leads, No. 1059,
- 1 Box with Needle Points, and Repair parts set

KEUFFEL & ESSER CO., NEW YORK

SPECIAL ARROW

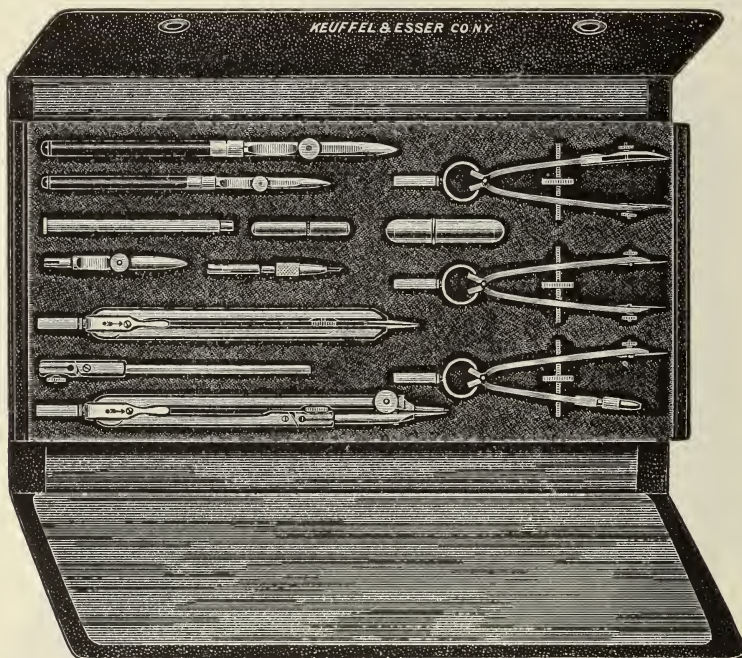
TRADE MARK

DRAWING INSTRUMENTS.

FLAT TYPE



TRADE MARK



No. NE 1086.

NE 1086. Pocket Case containing:-

- 1 Compasses, $6\frac{1}{4}$ in., with straightening device, and fixed Needle Point, Pen, Pencil Point, Lengthening Bar, and Extra Handle to convert pen to ruling pen, No. E 1050,
- 1 Hairspring Dividers, with straightening device, 6 in., No. E 1048,
- 1 Ringhead Bow Dividers, $4\frac{1}{4}$ in., with central thumbscrew, No. E 1065 $\frac{1}{2}$,
- 1 Ringhead Bow Pen, $4\frac{1}{4}$ in., with central thumbscrew, No. E 1066 $\frac{1}{2}$,
- 1 Ringhead Bow Pencil, $4\frac{1}{4}$ in., with central thumbscrew, No. E 1067 $\frac{1}{2}$,
- 1 Drawing Pen, $4\frac{1}{2}$ in., upper blade with spring, No. E 1072 $\frac{1}{2}$,
- 1 Drawing Pen, $5\frac{1}{2}$ in., upper blade, with spring, No. E 1074 $\frac{1}{2}$,
- 1 Box with 3 Leads, No. 1059,
- 1 Box with Needle Points and Repair Parts,..... set

NE 1086 $\frac{1}{2}$. Pocket Case containing the same assortment as No. NE 1086, but with $5\frac{7}{8}$ in. Detail Pen No. 977 in place of Drawing Pen No. E 1072 $\frac{1}{2}$ “

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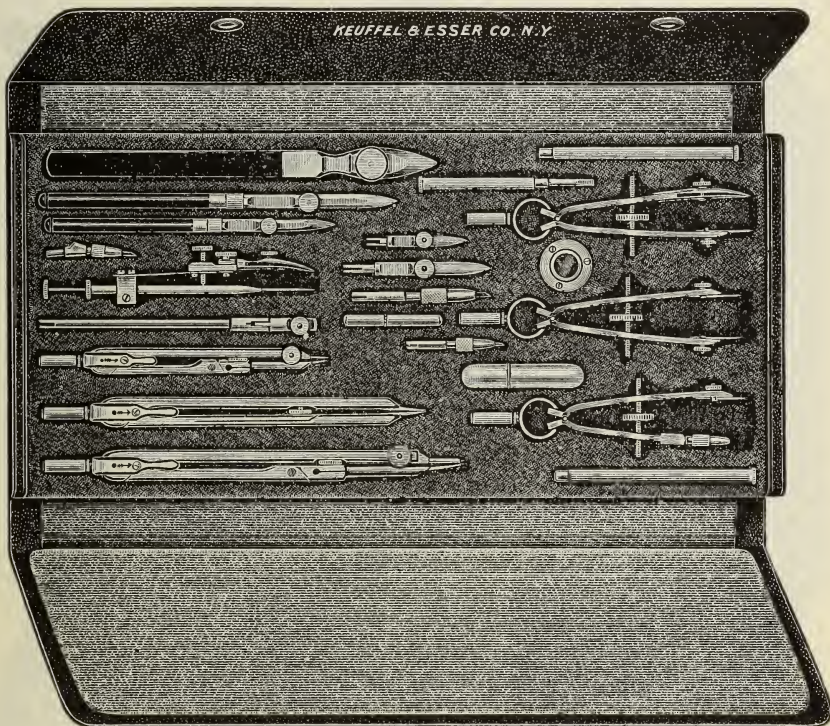
SPECIAL ARROW DRAWING INSTRUMENTS.

TRADE MARK

FLAT TYPE



TRADE MARK



No. NE 1088½

NE1088½. Pocket Case, containing:—

- 1 Compasses, 6½ in., with straightening device, and fixed Needle Point, Pen, Pencil Point, Lengthening Bar, and Extra Handle to convert pen to ruling pen, No. E 1050,
- 1 Compasses, 4½ in., with straightening device, and fixed Needle Point, Pen, Pencil Point, Lengthening Bar, and Extra Handle to convert pen to ruling pen, No. E 1043,
- 1 Hairspring Dividers, with straightening device, 6 in., No. E 1048,
- 1 Ringhead Bow Dividers, 4¼ in., with central thumbscrew, No. E 1065½,
- 1 Ringhead Bow Pen, 4¼ in., with central thumbscrew, No. E 1066½,
- 1 Ringhead Bow Pencil, 4¼ in., with central thumbscrew, No. E 1067½,
- 1 Drop Bow Pen and Pencil, 4 in., with spring blade, No. 964,
- 1 Detail Drawing Pen, 5½ in., upper blade with spring, No. 977,
- 1 Drawing Pen, 4½ in., upper blade with spring, No. E 1072½,
- 1 Drawing Pen, 5½ in., upper blade, with spring, No. E 1074½,
- 1 Box with 3 Leads, No. 1059,
- 1 Box with Needle Points and Repair Parts,
- 1 Horn Center, nickel silver rim, ¾ in. dia., No. 2691,
- 1 Screw-driver,set

KEUFFEL & ESSER CO. NEW YORK

SPECIAL ARROW

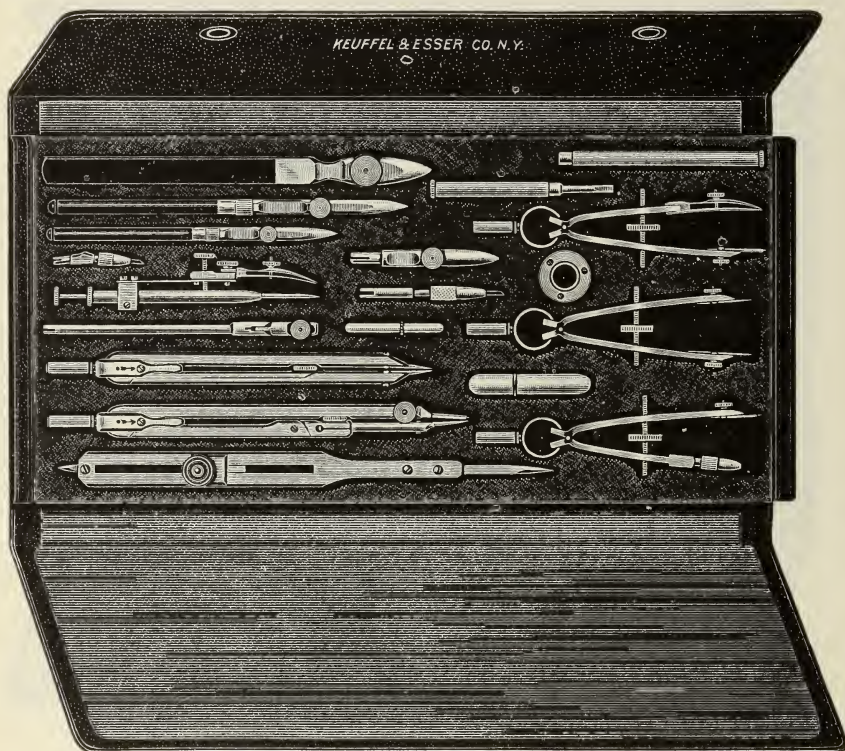
TRADE MARK

DRAWING INSTRUMENTS.

FLAT TYPE



TRADE MARK



No. NE 1089.

NE1089. Pocket Case, containing:—

- 1 Compasses, $6\frac{1}{2}$ in., with straightening device, and fixed Needle Point, Pen, Pencil Point, Lengthening Bar, and Extra Handle to convert pen to ruling pen, No. E1050,
- 1 Hairspring Dividers, with straightening device, 6 in., No. E1048,
- 1 Proportional Dividers, $7\frac{1}{2}$ in., divided for lines, No. 956-3,
- 1 Ringhead Bow Dividers, $4\frac{1}{2}$ in., with central thumbscrew, No. E1065 $\frac{1}{2}$,
- 1 Ringhead Bow Pen, $4\frac{1}{2}$ in., with central thumbscrew, No. E1066 $\frac{1}{2}$,
- 1 Ringhead Bow Pencil, $4\frac{1}{2}$ in., with central thumbscrew, No. E1067 $\frac{1}{2}$,
- 1 Drop Bow Pen and Pencil, 4 in., with spring blade, No. 964,
- 1 Detail Drawing Pen, $5\frac{1}{2}$ in., upper blade with spring, No. 977,
- 1 Drawing Pen, $4\frac{1}{2}$ in., upper blade with spring, No. E1072 $\frac{1}{2}$,
- 1 Drawing Pen, $5\frac{1}{2}$ in., upper blade with spring, No. E1074 $\frac{1}{2}$,
- 1 Box with 3 Leads, No. 1059,
- 1 Box with Needle Points and Repair Parts,
- 1 Horn Center, nickel silver rim, $\frac{3}{4}$ in. dia., No. 2691,
- 1 Screw-driverset

KEUFFEL & ESSER CO., NEW YORK

ARROW

TRADE MARK

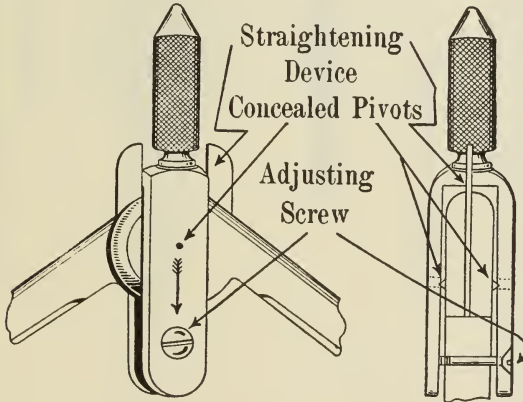
DRAWING INSTRUMENTS.

FLAT TYPE



ARROW Instruments are intended to meet the requirements of the large number of non-professional users who desire good, serviceable instruments at a moderate price. These instruments are of the Flat Type, which lends itself to machine production. They are made of rolled nickel silver and fine steel, and are well finished and fitted

Compasses and Dividers. Both instruments have heads with concealed pivot joints which are easily adjusted, without direct action upon the pivots themselves, to maintain the correct relation between the friction of the various parts. The straightening device is of a simple durable construction.



Bow Instruments. They are sturdy and very well made of the ringhead type and with side screw adjustment.

Drawing Pens. These pens are of very good quality. The steel is carefully tempered and the points are correctly shaped and finely sharpened.

Cases. These are very well made, covered with high quality imitation leather and velvet lined.



ARROW

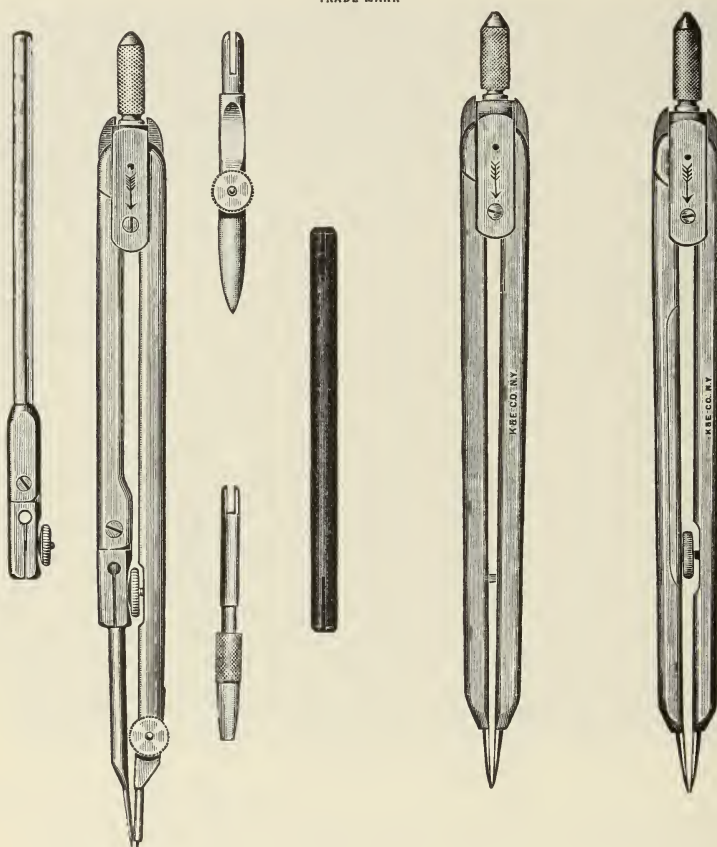
TRADE MARK

DRAWING INSTRUMENTS.

FLAT TYPE



TRADE MARK



No. 1050.

1046.

1048.

- 1050. Compasses, $6\frac{1}{2}$ in., with plain straightening device, and fixed Needle Point, Pen, Pencil Point, Lengthening Bar, and Extra Handle to convert pen to ruling pen. . . . each
- 1046. Plain Dividers, 6 in., with plain straightening device “
- 1048. Hairspring Dividers, 6 in., with plain straightening device. “
- 1059. Box for Leads “
- 1059 $\frac{1}{2}$. Box with Needle Points “



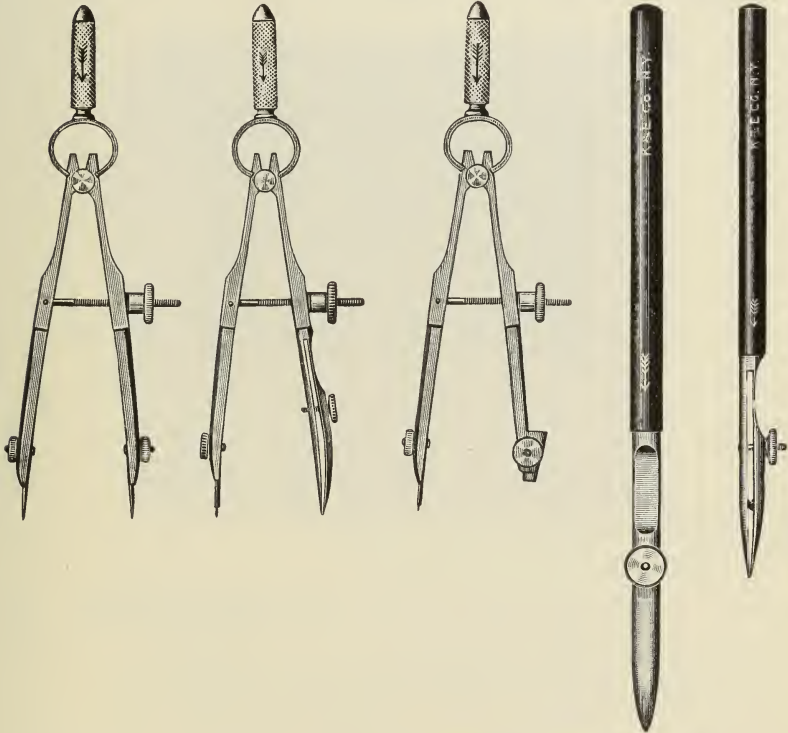
ARROW
TRADE MARK

DRAWING INSTRUMENTS.

FLAT TYPE



TRADE MARK



No. 1060.

No. 1061.

No. 1062.

No. 1074.

No. 1072.

- | | | |
|-------|---|------|
| 1060. | Ringhead Bow Dividers, 4 in., nickel silver Handle | each |
| 1061. | Ringhead Bow Pen, 4 in., with spring blade and needle point, nickel silver Handle | " |
| 1062. | Ringhead Bow Pencil, 4 in., with needle point, nickel silver Handle | " |
| 1072. | Drawing Pen, round type, upper blade with spring, 4½ in. | " |
| 1074. | Drawing Pen, round type, upper blade with spring, 5½ in. | " |



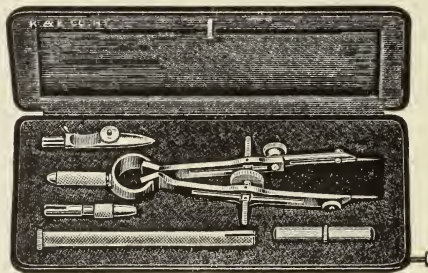
ARROW
TRADE MARK

DRAWING INSTRUMENTS.

FLAT TYPE



TRADE MARK



No. 1030.

1030. Pocket Set, in Bar-Lock Case, $5\frac{1}{2} \times 2\frac{1}{2}$ in.,

containing:-

- 1 Steelspring Bow Dividers, with central thumbscrew, 4 in.,
with fixed Needle Point, Pen and Pencil Point,
- 1 Handle for Pen and Pencil Point, nickel silver, $2\frac{3}{8}$
in., with reservoir for Needles, closed by screw cap,
containing extra needle-points,
- 1 Lead Box containing 3 leads.set

1031. Pocket Set, in Bar-Lock Case, $5\frac{1}{4} \times 2\frac{7}{8}$ in.,

containing same assortment as No. 1030, but with the
addition of

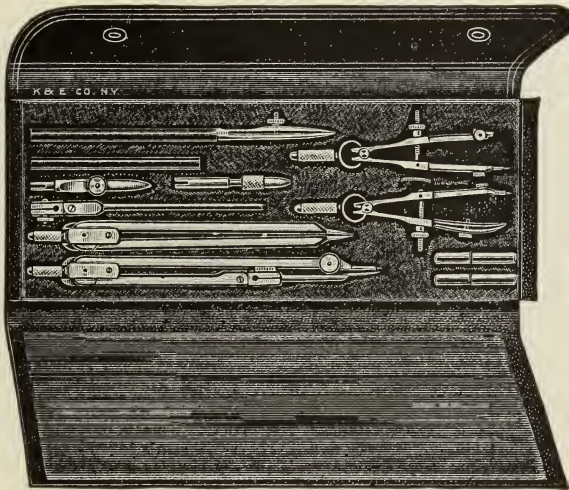
- 1 Lengthening Bar, by means of which circles up to $5\frac{1}{2}$
inches radius may be drawnset



ARROW
TRADE MARK

DRAWING INSTRUMENTS

FLAT TYPE



No. 1084 $\frac{1}{2}$.

1080. Pocket Case containing:-

- 1 Compasses, 6 $\frac{1}{4}$ in., with plain straightening device, and fixed Needle Point, Pen, Pencil Point, Lengthening Bar, and Extra Handle to convert pen to ruling pen, No. 1050,
- 1 Drawing Pen, 5 $\frac{1}{2}$ in., upper blade with spring, No. 1074,
- 1 Box with 3 Leads, No. 1059,
- 1 Box with Needle Points, No. 1059 $\frac{1}{2}$ set

1084 $\frac{1}{2}$. Pocket Case, containing:-

- 1 Compasses, 6 $\frac{1}{4}$ in., with plain straightening device, and fixed Needle Point, Pen, Pencil Point, Lengthening Bar, and Extra Handle to convert pen to ruling pen, No. 1050,
- 1 Plain Dividers, with straightening device, 6 in., No. 1046,
- 1 Ringhead Bow Pen, 4 in., No. 1061,
- 1 Ringhead Bow Pencil, 4 in., No. 1062,
- 1 Drawing Pen, 5 $\frac{1}{2}$ in., upper blade with spring, No. 1074,
- 1 Box with 3 Leads, No. 1059,
- 1 Box with Needle Points, No. 1059 $\frac{1}{2}$ set



ARROW

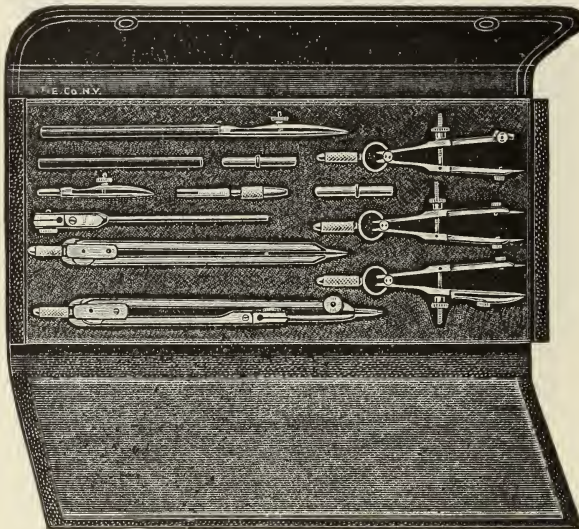
TRADE MARK

DRAWING INSTRUMENTS.

FLAT TYPE



TRADE MARK



No. 1085½.

1085½. Pocket Case containing:-

- 1 Compasses, 6½ in., with plain straightening device, and fixed Needle Point, Pen, Pencil Point, Lengthening Bar, and Extra Handle to convert pen to ruling pen, No. 1050,
- 1 Plain Dividers with plain straightening device, 6 in., No. 1046,
- 1 Ringhead Bow Dividers, 4 in., No. 1060,
- 1 Ringhead Bow Pen, 4 in., No. 1061,
- 1 Ringhead Bow Pencil, 4 in., No. 1062,
- 1 Drawing Pen, 5½ in., upper blade with spring, No. 1074,
- 1 Box with 3 Leads, No. 1059,
- 1 Box with Needle Points, No. 1059½.....set



ARROW

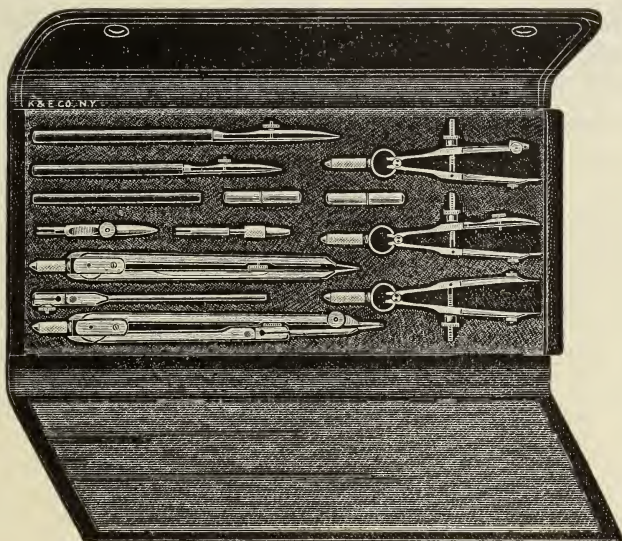
TRADE MARK

DRAWING INSTRUMENTS.

FLAT TYPE



TRADE MARK



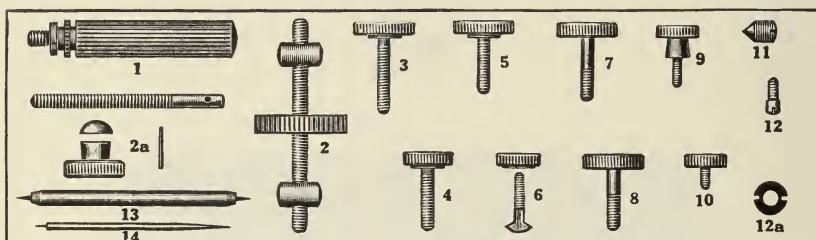
No. 1086.

1086. Pocket Case containing:-

- 1 Compasses, $6\frac{1}{2}$ in., with plain straightening device, and fixed Needle Point, Pen, Pencil Point, Lengthening Bar, and Extra Handle to convert pen to ruling pen, No. 1050,
- 1 Hairspring Dividers, with plain straightening device, 6 in., No. 1048,
- 1 Ringhead Bow Dividers, 4 in., No. 1060,
- 1 Ringhead Bow Pen, 4 in., No. 1061,
- 1 Ringhead Bow Pencil, 4 in., No. 1062,
- 1 Drawing Pen, $4\frac{1}{2}$ in., upper blade with spring, No. 1072,
- 1 Drawing Pen, $5\frac{1}{2}$ in., upper blade with spring, No. 1074,
- 1 Box with 3 Leads, No. 1059,
- 1 Box with Needle Points, No. 1059 $\frac{1}{2}$ set

KEUFFEL & ESSER CO., NEW YORK

REPAIR PARTS. KEY AND ANVIL INSTRUMENTS.



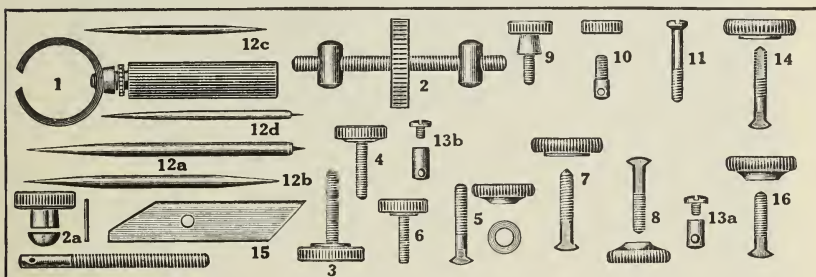
Illustrations are to show parts and do not necessarily show exact design.

Cat. Nos.		Parts	Each	
Key	Anvil		Key	Anvil
879-1	979-1	Nickel-Silver Bow Handle.....		
2	2	Complete Bow Center Screw with Nuts.....		
2a	2a	Bow Adjusting Screw, Nut and Washer.....		
3	3	Large Ruling Pen Thumb Screw.....		
4	4	Small Ruling Pen Thumb Screw.....		
5	5	Compasses Pen Thumb Screw.....		
6	6	Bow Pen Thumb Screw.....		
7	7	Compasses Clamp Screw.....		
8	8	Lengthening Bar Clamp Screw.....		
9	9	Pencil Lead Clamp Screw for Compasses and Bow Pen..		
10	10	Bow Needle Clamp Screw.....		
11	11	Compasses Head Pivot Screw (old type).....		
12	12	Compasses Head Set Screw (old type).....		
12a	12a	Compasses Head Pivot Screw and Lock Nut.....		
13	13	Shouldered Needle for Compasses.....		
14	14	Needles for Bows.....		
15	15	Needle and Pencil Part for Large Compasses.....		
16	16	Pen Part for Large Compasses.....		
17	17	Lengthening Bar for Large Compasses.....		
18	18	Needle and Pencil Part for Small Compasses.....		
19	19	Pen Part for Small Compasses.....		
20	20	Handle for Small Drawing Pen.....		
21	21	Handle for Large Drawing Pen.....		
None	22	Detachable Handle with Pricker Point for No. 975.....		

KEUFFEL & ESSER CO., NEW YORK

REPAIR PARTS.

PHAROS AND ARROW INSTRUMENTS.

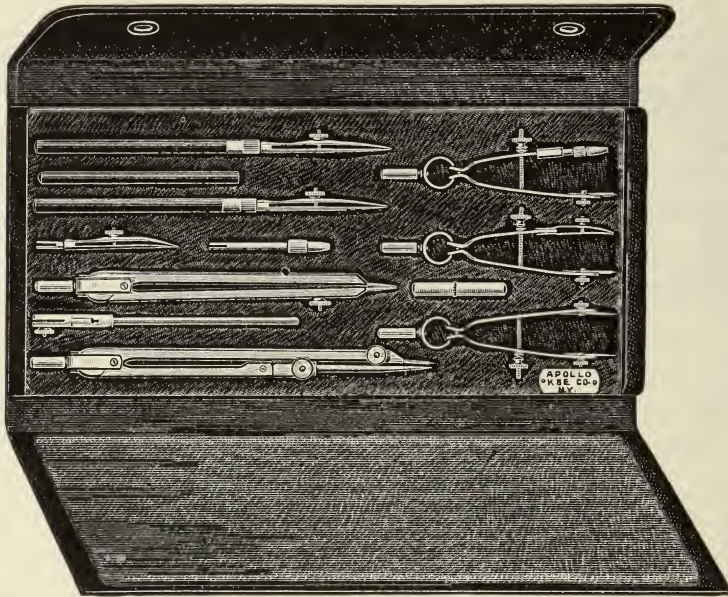


Illustrations are to show parts and do not necessarily show exact design.

Cat. Nos.		Parts	Each Special Arrow and Pharos Arrow
Pharos	Special Arrow and Arrow		
679-1	1079-1	Bow Spring Head and Handle.....	
2	2	Complete Bow Center Screw with Nuts.....	
	2a	Bow Adjusting Screw, Nut and Washer.....	
3	3	Large Ruling Pen Thumb Screw (Pharos and Special Arrow)	
3 1/2	3 1/2	Large Ruling Pen Thumb Screw (Arrow).....	
4	4	Small Ruling Pen Thumb Screw (Pharos and Special Arrow)	
4 1/2	4 1/2	Small Ruling Pen Thumb Screw (Arrow).....	
5	5	Compasses Pen Screw and Nut.....	
6	6	Bow Pen Thumb Screw.....	
7	7	Compasses Clamp Screw and Nut.....	
8	8	Lengthening Bar Clamp Screw and Nut.....	
9	9	Bow Pencil Clamp Screw.....	
10	10	Bow Needle Screw and Nut.....	
11	11	Compasses Head Screw Bolts.....	
12a	12a	Compasses Needles.....	
12b	12b	Dividers Needles.....	
12c	12c	Bow Dividers Needles.....	
12d	12d	Bow Pen and Pencil Needles.....	
13a	13a	Compasses Needle Screw and Nut.....	
13b	13b	Dividers Needle Screw and Nut.....	
14	14	Hairspring Dividers Adjusting Screw and Nut.....	
15	15	Compasses Needle Clamp.....	
16	16	Screw and Nut for Compasses Needle Clamp.....	



SCHOOL QUALITY INSTRUMENTS.



In addition to the drawing instruments listed in this catalogue, a complete line of "School Quality" Drawing Instruments, suitable to the needs of students of Preparatory Schools, High Schools, and Manual Training Schools, are also carried.

Square Type

Challenge

Excelsior

Favorite

Flat Type

Jupiter

Jupiter special

Apollo

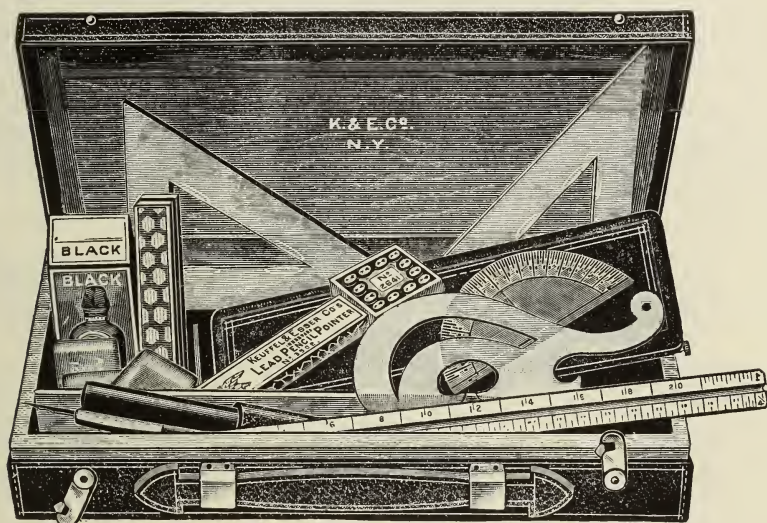
They are described and illustrated in our Catalogue entitled—

**Drawing Instruments and Materials for High Schools,
Preparatory Schools and Manual Training Schools.**

which will be sent without charge upon request.



CASES FOR DRAWING TOOLS.



No. 1100.

1100. Sewed Leather Carrying Case for Drawing Tools each

Fine Sewed Leather Case, buff color, $13\frac{1}{2} \times 6\frac{1}{2} \times 2\frac{1}{2}$ in., with grip handle and nickelplated safety hooks, lined with wood and partitioned for set of instruments, triangles, curves, scales, pencils, thumbtacks, rubbers, liquid ink, pencil pointer, etc. A neat, convenient, and durable case for students and others who carry their drawing tools about.

WOODEN CASES WITH LOCK AND TRAY.

These Cases are made of thoroughly seasoned wood, have a tray to hold the instruments, and under the tray, room for colors, brushes, etc.

The dimensions refer to the size of the tray in the box.

The price of the case includes the fitting of the instruments.

Size of Tray.

Mahogany. Nickel-plated Hinges and Lock, Tray lined with Silk Velvet.

No. 1101.

- D. 6×10 in. each
 F. 7×13 " "

POCKET CASES WITH FOLDING FLAPS.

These Cases are covered with heavy leather velvet lined, with four flaps and button lock as illustrated on page 128, etc.

The price of the case includes the fitting of the instruments.

Size of Case about	Lined with Velvet.	Lined with Silk Velvet.
	No. 1102.	No. 1103.
A. 3×6 in.	each	each
C. $3\frac{1}{2} \times 8\frac{1}{2}$ "	"	"
E. $4 \times 9\frac{1}{2}$ "	"	"
H. $5\frac{1}{2} \times 10$ "	"	"

KEUFFEL & ESSER CO., NEW YORK

PANTOGRAPHS

SUSPENDED PANTOGRAPHS.

Suspended Pantographs, (Nos. 1123 to 1131) are very delicate instruments. There is no friction of the supports of the bars on the drawing, as the entire mechanism is suspended. The following table indicates the capacity of these instruments for tracing a figure in one operation:

Ratio	Length of Bars			
		28 in.	No. 1129	38 in.
				No. 1123 No. 1124C No. 1131
	Dimensions of greatest rectangle which can be traced.			
1:20 to 1:12		35 × 35 in.		47 × 47 in.
1:10 to 1:8		33 × 33 in.		45 × 45 in.
1:6 to 2:5		31½ × 31½ in.		42½ × 42½ in.
1:2		23½ × 28 in.		31½ × 39 in.
3:5		18½ × 28 in.		26 × 39 in.
2:3		16½ × 28 in.		22 × 39 in.
3:4		10½ × 28 in.		14 × 39 in.
4:5		8½ × 28 in.		11½ × 39 in.
Ratio 1:1 can be obtained only with Nos. 1123 and 1124 C.				
1:1		—————		23½ × 35 in.

Of the **Suspended Pantographs** only **Nos. 1123 to 1124 C** will reproduce in all ratios from 1 : 1 to 1 : 20 or 20 : 1, as only these pantographs have the arrangement for placing the pole within the parallelogram (interchanging the pole for one of the tracing points). Other suspended pantographs do not have this arrangement, and reproduce only within the limits stated in the description of each.

Precision Pantographs Nos. 1123 to 1124 C, on account of their fine mechanical construction, are especially adapted for very accurate reproductions, and are highly recommended to Civil and Mechanical Engineers, Topographers, Hydrographers, Engravers and Lithographers.

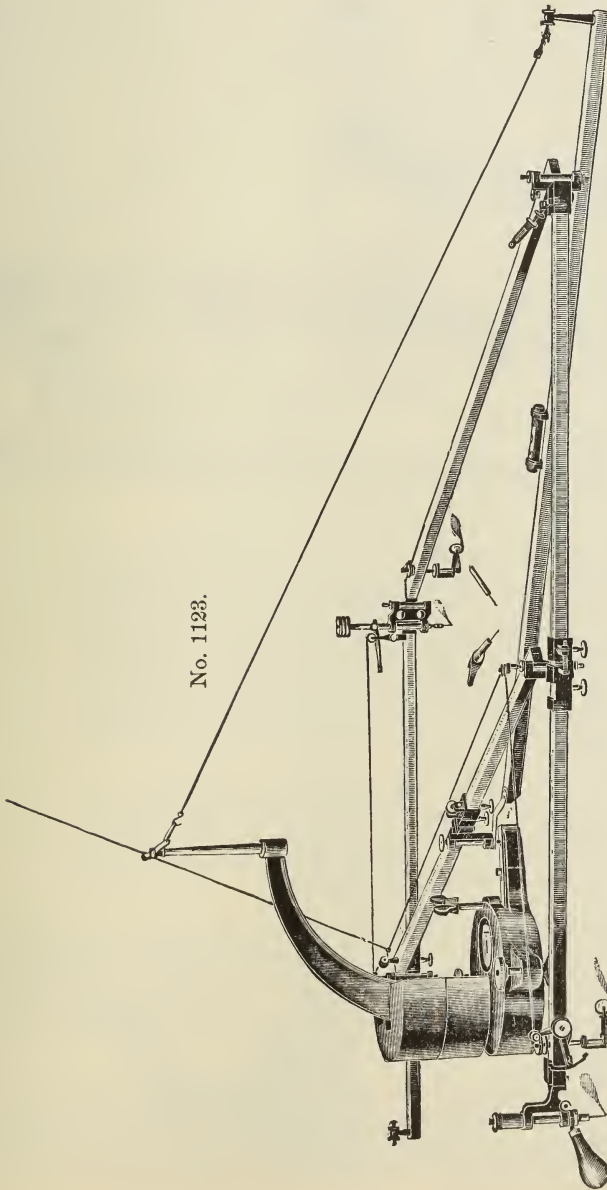
Suspended Pantographs Nos. 1129 to 1131 are of simpler construction, although of the same class of workmanship and material as Nos. 1123 to 1124 C. These instruments are recommended to Designers, Pattern Makers, etc., for drawings where the highest degree of accuracy is not required.

Suspended Pantograph No. 1134 has wooden bars which are not graduated throughout; it is therefore, limited to the ratios for which it is marked, as stated in the description. Within its range it is a good, reliable instrument. The wooden bars are made of thoroughly seasoned wood in the K & E factory at Hoboken, N. J. The wooden bars of imported instruments, due to climatic differences between this country and Europe, are apt to warp, contract and expand; which impairs the accuracy of the instrument.

KEUFFEL & ESSER CO., NEW YORK

PRECISION PANTOGRAPHS.

For Reproducing to even scale, enlarging up to 1 : 20 and reducing up to 20 : 1
in all ratios.



No. 1123.

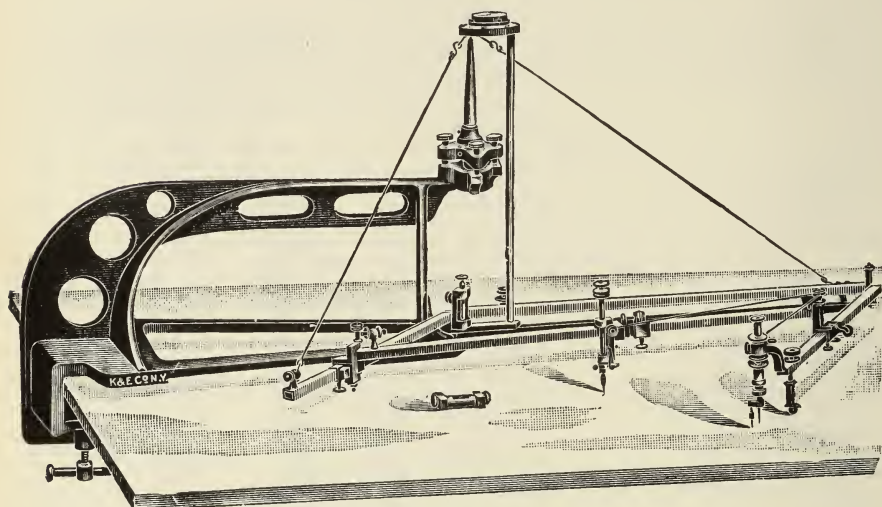
Suspended Precision Pantograph of hollow, square metal bars, connected by pivot joints; the bars are graduated throughout, and the sliding sockets are provided with verniers and micrometer adjustments. Extra Supporting Bar and appliances for setting up the instrument with the pole within the parallelogram, in which position it will reproduce the size of the original. (see illustration). Pole and pencil point interchangeable. Convenient contrivance for operating the pencil from the tracing point. Solid Iron Standard, with 2 Spirit Levels, 2 Leveling Screws, and 1 extra Weight. Instrument, with adjustable Tracing Point, Pencil Point with 3 Brass Weights, 2 Steel Points, 1 Spirit Level, 1 Box of 5-inch Leads, Directions and Formula for computing the setting for any ratio; in polished hardwood Case, with lock and key.

1123. Length of Bars, 38 inches . . . each

KEUFFEL & ESSER CO., NEW YORK

PRECISION PANTOGRAPHS.

For Reproducing to even scale, enlarging up to 1 : 20 and reducing up to 20 : 1 in all ratios.



No. 1124C.

1124C. Suspended Precision Pantograph, extra large adjustable clamping Standard, the base of which is raised off the board, so that the drawing can be slipped under it. Hollow square metal bars, **38 in.**, connected by pivot joints, graduated throughout, the sliding sockets with vernier and micrometer adjustments. Extra supporting bar and appliances for setting up the instrument with the pole within the parallelogram, to reproduce in the size of the original. Pole and pencil point interchangeable. Convenient contrivance for operating the pencil from the tracing point.

Instrument complete, with adjustable Tracing Point, Pencil Point with 3 Brass Weights, 2 Steel Points, 1 Spirit Level, 1 box of 5-inch Leads, Directions and Formula for computing the setting for any ratio; in polished hardwood Case with lock and key, separate Box for Standard each

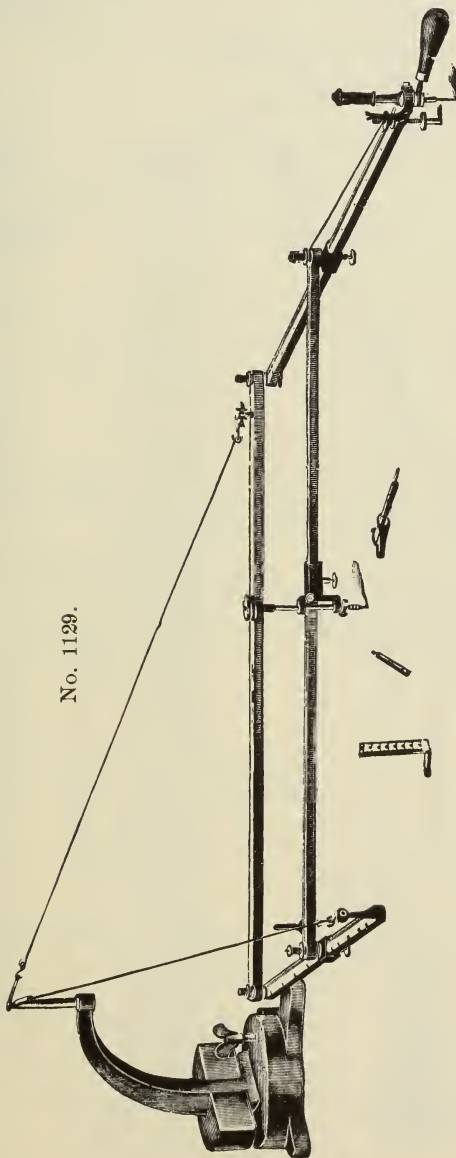
This suspended Pantograph has a large, brace-shaped standard of great stability and rigidity, held in position by a clamp screw. The base of the standard is raised off the board to admit of slipping the drawing under it, a great convenience when reducing drawings. The vertical support of the standard is adjusted by a 4-screw leveling head and its adjustment controlled by means of a sensitive cross level with fork-shaped support, resting on the ball pole of the base of the standard. This level is removed after the vertical support has been adjusted.

The advantage of the extra-large, brace-shaped standard is that the instrument is clamped to the table or board, thus doing away with weights and avoiding damage to the board from the fastening screw. There are no leveling screws in the base to injure the board or the drawing, and the standard is easily adjusted by means of its four leveling screws (as on surveying instruments).

KEUFFEL & ESSER CO., NEW YORK

SUSPENDED PANTOGRAPHS.

For Reducing from 20 : 1 to 5 : 4 or Enlarging from 1 : 20 to 4 : 5 in all ratios.



No. 1129.

Suspended Pantograph of hollow, square metal bars, connected by cone joints; the bars are fully graduated and the edges of the sliding sockets are beveled to facilitate the reading of ratios. Tracing and Pencil Point are interchangeable. Plain solid iron Standard with 1 extra Weight. Instrument, with adjustable Tracing Point, Pencil Point with 3 Brass Weights, 2 Steel Points, 1 box of 5-inch Leads, Directions and Formula for computing the setting for any ratio; in hardwood Case, with lock and key.

1129.	Length of Bars, 28 inches	each
1131.	" " 38 "	"

KEUFFEL & ESSER CO., NEW YORK

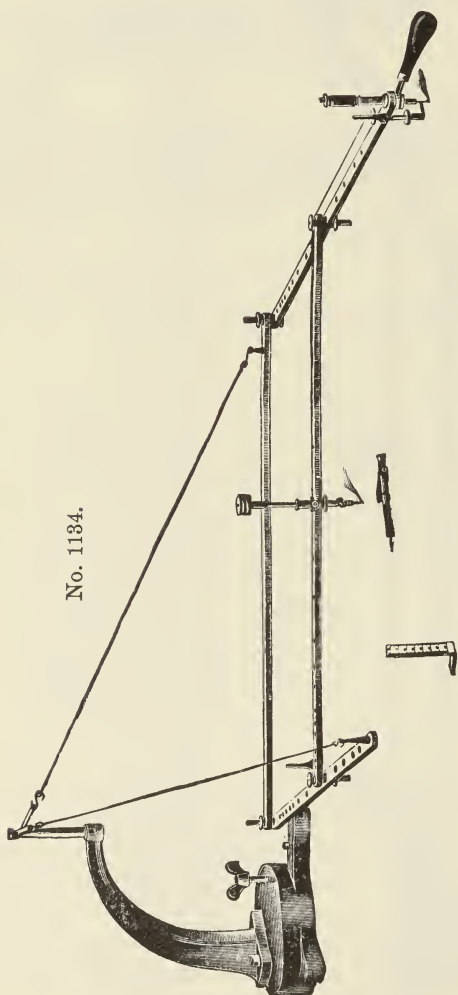
SUSPENDED PANTOGRAPHS

WITH WOODEN BARS.

For Reducing and Enlarging in the following ratios:

5:4, 4:3, 3:2, 5:3, 2:1, 5:2, 3:1, 4:1, 5:1, 6:1, 8:1, 10:1,
12:1, 20:1, or vice-versa.

No. 1134.



Suspended Pantograph of strong, well-seasoned, wooden Bars connected by cone joints in brass bearings, and provided with holes accurately spaced for the above ratios. Tracing and Pencil Point are interchangeable. Plain solid iron Standard. Instrument, with adjustable Tracing Point, Pencil Point with 3 Brass Weights, 1 Steel Point, 1 box of 5-inch Leads and Directions; in hard-wood Case.

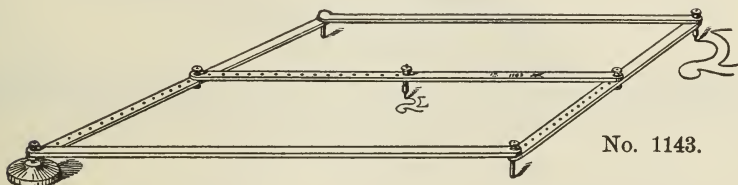
1134. Length of Bars, 38 inches . . . each

Note: The wooden bars are made of thoroughly seasoned wood in the K & E factory at Hoboken, N. J. The wooden Bars of imported instruments, due to climatic differences between this country and Europe, are apt to warp, contract and expand, which impairs the accuracy of the instrument.

KEUFFEL & ESSER CO., NEW YORK

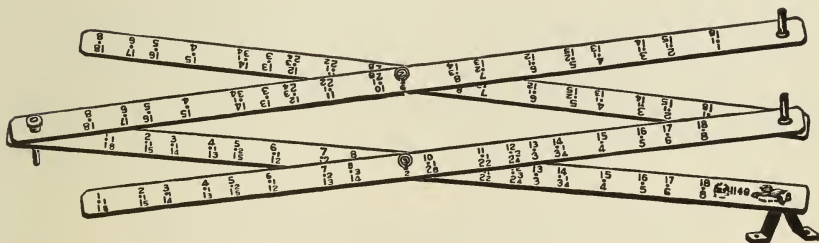
PANTOGRAPHS OF HARDWOOD.

Pantograph 1143-44 have our improved tracer and lead holders fitted for the usual Artist Lead, which is interchangeable with the steel tracer point, without interchanging the holders themselves. These points are held by a screw sleeve. All metal parts are nickel plated.



No. 1143.

1143. Pantograph of polished Hardwood, bars $22\frac{1}{2}$ in.; for reducing and enlarging drawings in 15 ratios, from 2:1 to 16:1 or vice-versa; in plain box, with Directions each

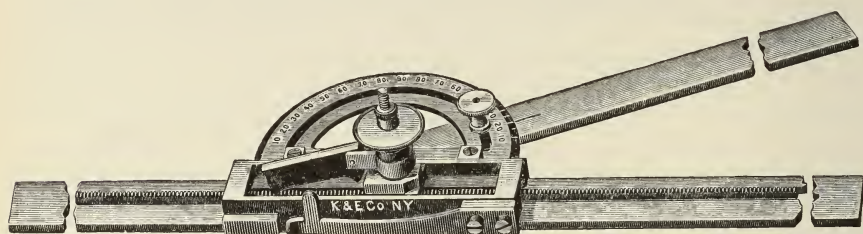


No. 1149.

1144. Pantograph of polished Hardwood, bars 21 in., metal foot; tracer needle and lead point interchangeable; for reducing and enlarging drawings in 34 ratios, from 8:1 to $1\frac{1}{8}$:1 or vice-versa; in plain box, with Directions each
1148. Pantograph of Hardwood, nickelplated mountings, adjustable lead, bars 21 in.; for reducing and enlarging drawings in 25 ratios, 8:1 to $1\frac{1}{8}$:1; in plain box, with Directions, each
1149. Pantograph of Hardwood, nickelplated mountings, lead pencil and tracer in tubular holders, bars 21 in.; for reducing and enlarging drawings in 18 ratios, from 8:1 to $1\frac{1}{8}$:1; in plain box, with Directions. “



BOTH'S PATENT SECTION LINER AND SCALE DIVIDER.



No. 1160.

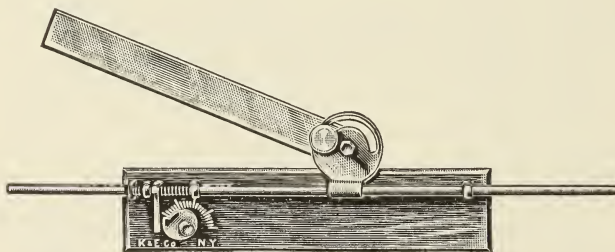
- 1160. Both's Patent Section Liner and Scale Divider, nickel silver,** base $14\frac{3}{4}$ in. Protractor graduated to degrees, with Vernier reading to five minutes. Instrument in leatheret covered Case, with full Directions for setting and using . each

Both's Patent Section Liner and Scale Divider is the easiest to manipulate, the most rapid and exact in execution, the finest in workmanship and the most durable of any hitherto known.

The essential parts of Both's Patent Section Liner are: a flat rack bar $14\frac{3}{4}$ in. long, bearing an accurately cut rack 9 in. long with 24 teeth to the inch, and a nicely fitted carriage made to slide on the rack bar; to this are attached the semi-circular protractor graduated to degrees, the pivoted ruler arm extending 10 in. beyond the protractor, and the mechanism for uniformly advancing the ruler arm. This mechanism consists of a steel pawl which engages in the teeth of the rack bar, taking from one to six teeth at a time, according to the take-up to which the adjusting nut has been set. The slide and with it the ruler arm, are made to advance on the rack bar by pressing on a knob which causes the pawl to engage in a tooth of the rack.

SIMPLEX SECTION LINER.

TRADE MARK



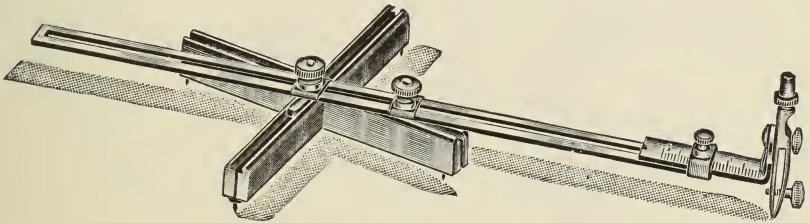
No. 1166C.

- 1166C. Simplex Section Liner, hardwood base, rod 15 in., rule 7 in.,** heavy transparent xylonite arm; held on the drawing by pins at bottom of base “

The Simplex is a simple section liner with which fairly good work can be done. It will space up to about $\frac{1}{2}$ in. and is very easy to handle.



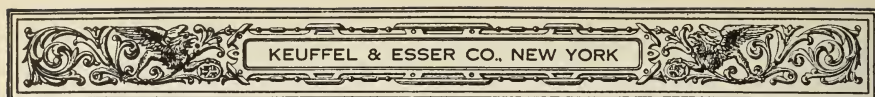
ELLIPSOGRAPH.



No. 1181.

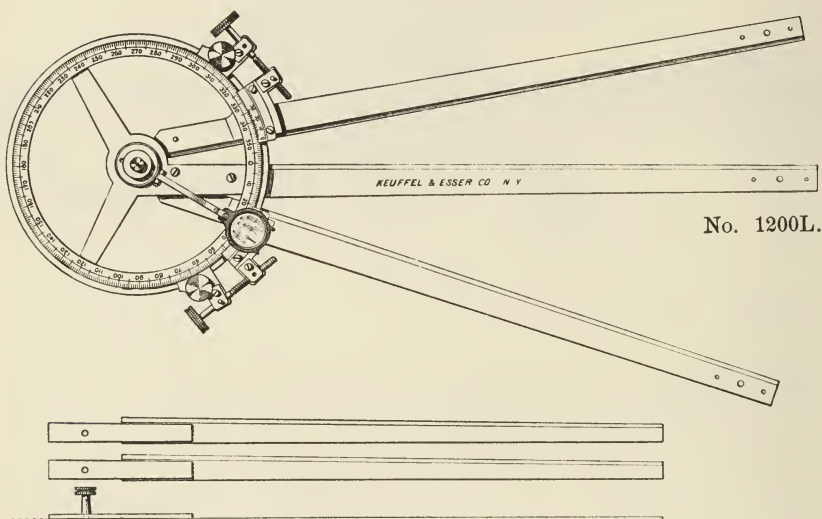
1181. Ellipsograph, brass, nickelplated, fine quality, 9 in. bar, with pen and pencil point (in one piece). In case, each

This instrument draws ellipses of any shape, from 6 inches to 18 inches major axis, with great accuracy. The pen-pencil point can be taken off and stored compactly in the case.



PROTRACTORS.

THREE ARM PROTRACTOR.



No. 1200L.

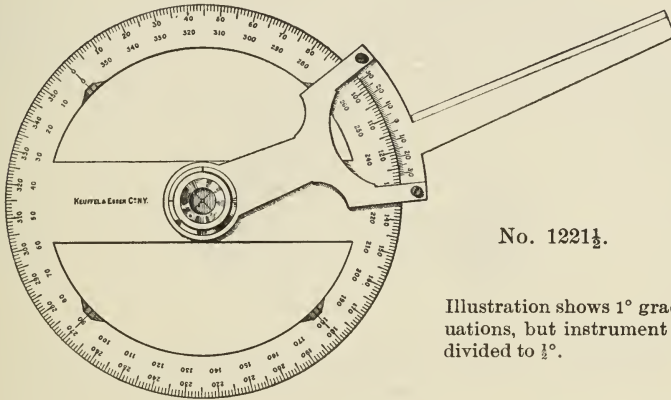
- 1200L.** Three-Arm Protractor or Station Pointer, with left hand move-
able blade closing to zero; in hardwood Case, with Screw-
driver each
- 1200R.** Three-Arm Protractor or Station Pointer, with right hand move-
able blade closing to zero; in hardwood Case, with screw-
driver each

Protractor as made by us for the U. S. Navy and U. S. Coast and Geodetic Survey. Bronze Circle $6\frac{1}{2}$ in., divided on *solid silver* to half degrees, numbered in opposite directions from 0 to 180 both ways on outer row, and 180 to 360 both ways on inner row, with 2 verniers reading to 1 minute. Both verniers with tangent screw. Magnifying lens on center. Two interchangeable Tubular Centers $\frac{9}{16}$ in. diameter, with transparent bottom, removable cylinder for center with spring point for marking center exactly. Three nickel silver arms, 18 in. long, each with extension piece $13\frac{1}{2}$ in. long with setscrew to lengthen to $31\frac{1}{2}$ inches measured from the center of circle.

KEUFFEL & ESSER CO., NEW YORK

PARAGON PROTRACTORS.

REG. U. S. PAT. OFF.

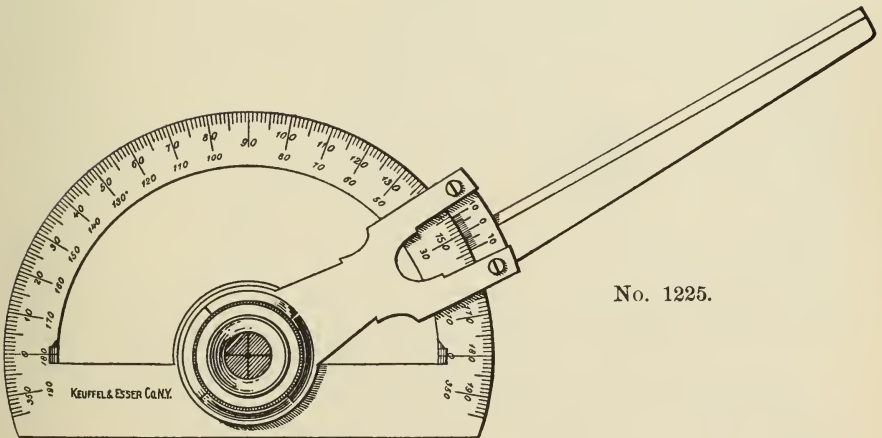


No. 1221 $\frac{1}{2}$.

Illustration shows 1° graduations, but instrument is divided to $\frac{1}{2}$ °.

1221 $\frac{1}{2}$. Circular nickel silver Protractor, 8 in., with Horncenter and Movable Arm, divided to $\frac{1}{2}$ °, long Vernier reading to 1 minute. Length of arm beyond outer edge of Protractor 6 in. each

1221 $\frac{1}{2}$ M. do. do. but in leatheret covered Case “



No. 1225.

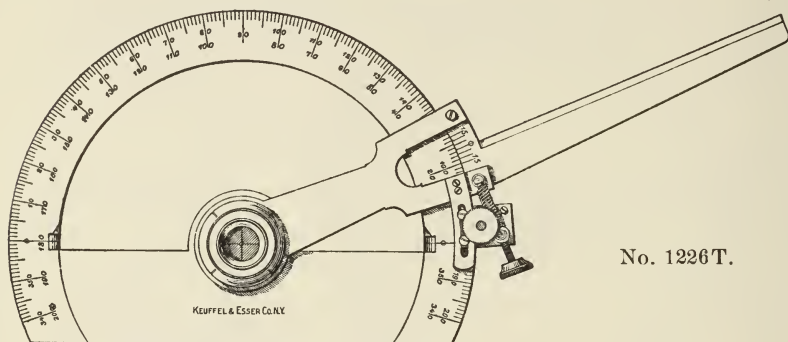
1225. Semicircular nickel silver Protractor, 6 in., with Horncenter and Movable Arm, div. to $\frac{1}{2}$ °, Vernier reading to 5 minutes. Length of arm beyond outer edge of Protractor, 5 $\frac{1}{2}$ in. each

1225M. do. do. but in leatheret covered Case, . . . “



PARAGON PROTRACTORS.

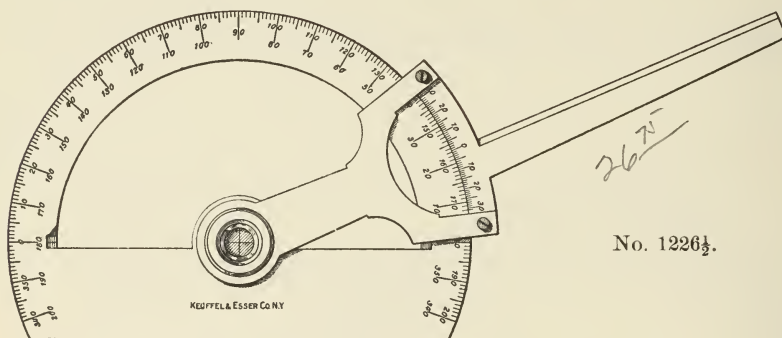
REG. U. S. PAT. OFF.



No. 1226T.

1226T. Semicircular nickel silver Protractor with Tangent Screw 8 in., div. to $\frac{1}{4}^{\circ}$, Vernier reading to 1 minute, Length of arm beyond outer edge of Protractor, 6 in. each

1226TM. do. do. but in leatheret covered Case, “



No. 1226 $\frac{1}{2}$.

1226 $\frac{1}{2}$. Semicircular nickel silver Protractor, 8 in., with Horn-center and Movable Arm, div. to $\frac{1}{2}^{\circ}$, Vernier reading to 1 minute. Length of arm beyond outer edge of Protractor, 6 in. each

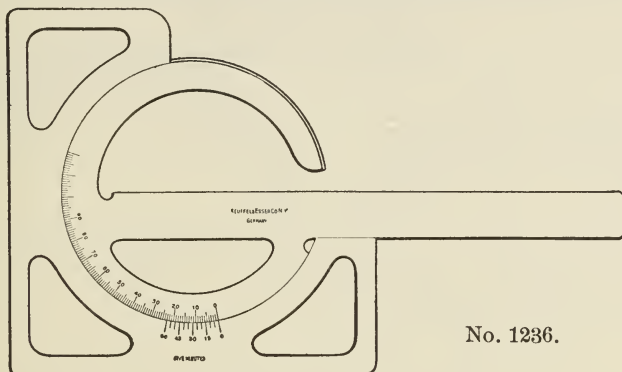
1226 $\frac{1}{2}$ M. do. do. but in leatheret covered Case. “

1227 $\frac{1}{2}$. Semicircular nickel silver Protractor, like No. 1226 $\frac{1}{2}$ but 10 in. Length of arm beyond outer edge of Protractor, 6 $\frac{1}{2}$ in. “

1227 $\frac{1}{2}$ M. do. do. but in leatheret covered Case, “



LIMB PROTRACTOR.



No. 1236.

1236. Draftsman's Nickel Silver Protractor, each

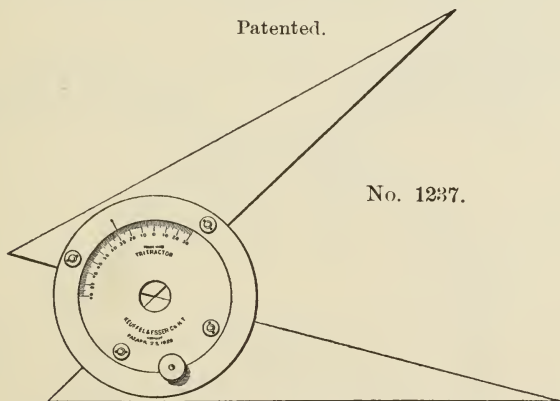
1236C. Leatheret Covered Case for No. 1236 “

Nos. 1236 and 1236C are old Nos. 1253 and 1253C.

This Protractor is of nickel silver, graduated on one side to degrees, vernier reading to 5 minutes. Blade $8\frac{1}{2}$ inches long. Used chiefly in connection with a T square or Straightedge. Being perfectly flush on both sides, it can be used either side up and on either edge of the blade. Particularly convenient in dividing circles, transferring angles, drawing oblique lines at right angles to each other or laying off given angles on each side of a line without changing the setting.

THE TRITRACTOR.

Patented.



No. 1237.

1237. Tritractor, nickel silver, circle 3 in. diameter, graduated to 1° over an arc of 120 degrees. One arm movable. Length of each triangular arm, 10 inches. In leatheret covered velvet lined case each

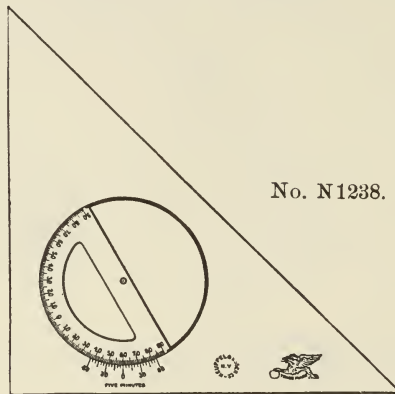
The Tritractor, which is made of nickel silver, serves the purposes of a protractor as well as a set of triangles. It consists of two triangular 10 inch arms, one of which is attached to a fixed disc 3 inches in diameter, the other to a movable ring concentric with the fixed disc. The ring carries an index from which the angles indicated on the graduations are read. The inner edges of the two triangular arms always form an angle which is exactly 30 degrees greater than the angle formed by the outer edges; while the angle between the outer and inner edges of each triangular arm is 15 degrees. The movable arm can be clamped in any position.

No. 1237 is old No. 1251.



ADJUSTABLE PROTRACTOR TRIANGLE.

Belcher's Patent.



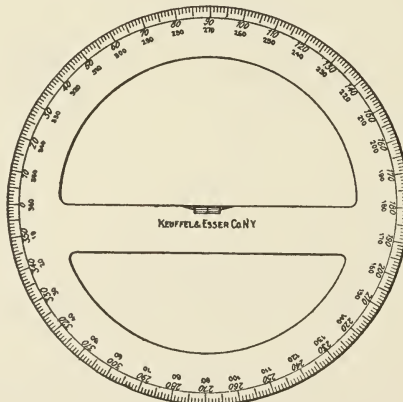
N1238. Adjustable Protractor Triangle, 8 in., xylonite, (transparent),
 $45^\circ \times 45^\circ \times 90^\circ$ each

The semicircular protractor, $3\frac{1}{2}$ in. diam., is graduated to single degrees, numbered 0-90 at every 10 degrees in both directions, double vernier reading to 5 minutes. It revolves in a circular groove, where it is held by a spring. The triangle and protractor are flush on both sides so that either side can be used for drawing slopes in opposite directions, etc. The base line of the protractor has a drawing edge.

No. N1238 is old No. 1255.

PARAGON PROTRACTOR

REG. U. S. PAT. OFF.



No. 1240.

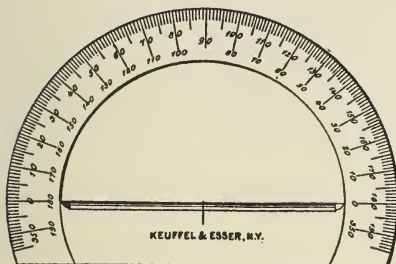
1240. Circular nickel silver Protractor, 6 in., beveled edge,
 divided to $\frac{1}{2}^\circ$ each

No. 1240 is old No. 1235.

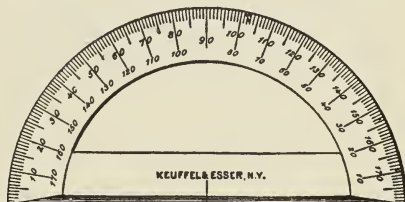


PARAGON PROTRACTORS.

REG. U. S. PAT. OFF.



No. 1241.



No. 1245.

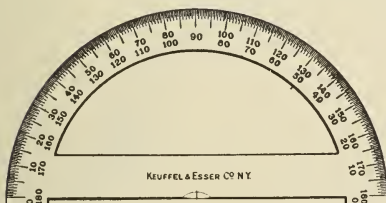
Center on inner edge

1241. Semicircular nickel silver Protractor, 5 in., beveled edge, divided to $\frac{1}{2}^{\circ}$ each
 1243. do. 6 " " $\frac{1}{4}^{\circ}$ "

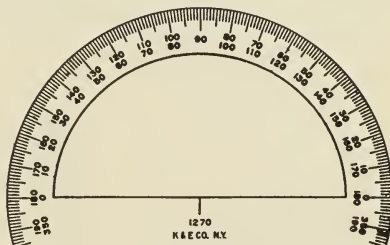
Center on outer edge

1245. Semicircular nickel silver Protractor, 4 in., beveled edge, divided to 1° each
 1248. do. 6 " " $\frac{1}{4}^{\circ}$ "

PLAIN METAL PROTRACTORS.



No. 1258.



1270.

Nickel Silver.

1258. Highgrade Semicircular Protractor, $4\frac{1}{4}$ in., div. to $\frac{1}{2}^{\circ}$ each
 Steel, "White Enameled."

- 1265 $\frac{1}{2}$. Semicircular Protractor, $3\frac{3}{4}$ in., divided to 1° each

Brass.

1266. Semicircular Protractor, $4\frac{1}{4}$ in., divided to 1° each
 1267. do. do. $5\frac{1}{4}$ " " 1° "

Brass "White Enameled."

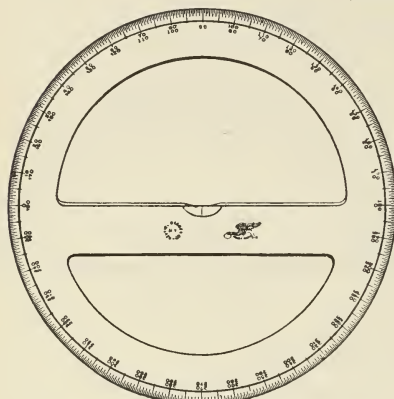
1270. Semicircular Protractor, $3\frac{3}{4}$ in., divided to 1° each

The advantage of the "white enameled" protractor over the ordinary brass protractor lies in the fact that in the "white enameled" protractor the black graduations and numbers stand out prominently against a white background. This facilitates reading and obviates the possibility of errors.

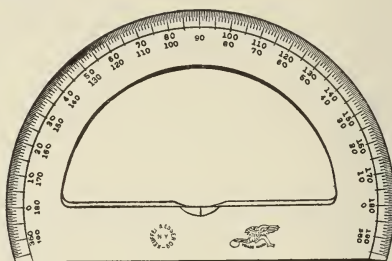


XYLONITE PROTRACTORS.

(Transparent)



No. 1273



No. 1274

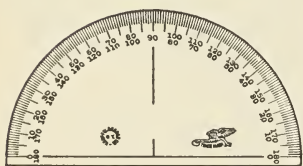
BEVELED EDGE.

- 1273-6. Circular Xylonite Protractor, beveled edge, 6 in., $\frac{1}{2}^\circ$ each
 -8. do. do. do. " " 8 " $\frac{1}{2}^\circ$ "
 -10. do. do. do. " " 10 " $\frac{1}{2}^\circ$ "

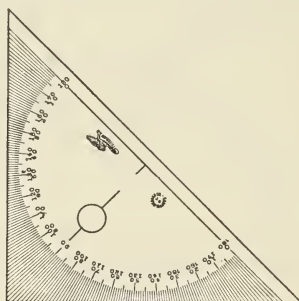
No. 1273 is old Nos. 1871 to 1873.

- 1274-6. Semicircular Xylonite Protractor, beveled edge, 6 in., $\frac{1}{2}^\circ$ "
 -8. do. do. do. " " 8 " $\frac{1}{2}^\circ$ "

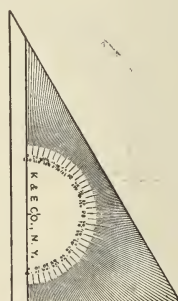
No. 1274 is old Nos. 1869 to 1870.



No. 1276.



1277.



1278.

- 1276-4. Semicircular Xylonite Protractor, 4 in., div. to 1° each
 -5. " " " 5 " " $\frac{1}{2}^\circ$ "
 -6. " " " 6 " " $\frac{1}{2}^\circ$ "
 -8. " " " 8 " " $\frac{1}{2}^\circ$ "
 -10. " " " 10 " " $\frac{1}{2}^\circ$ "

No. 1276 is old No. 1868.

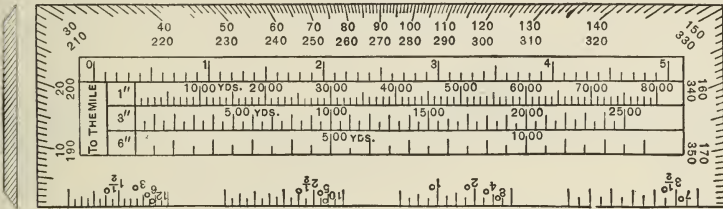
- 1277-5. Xylonite Protractor Triangle, 45° , 5 " " 1° "
 -7. " " " 7 " " 1° "

No. 1277 is old No. 1867.

- 1278-6. Xylonite Protractor Triangle, $30 \times 60^\circ$, 6 in., div. to 1° "
 No. 1278 is old No. 1866.



MILITARY PROTRACTOR.

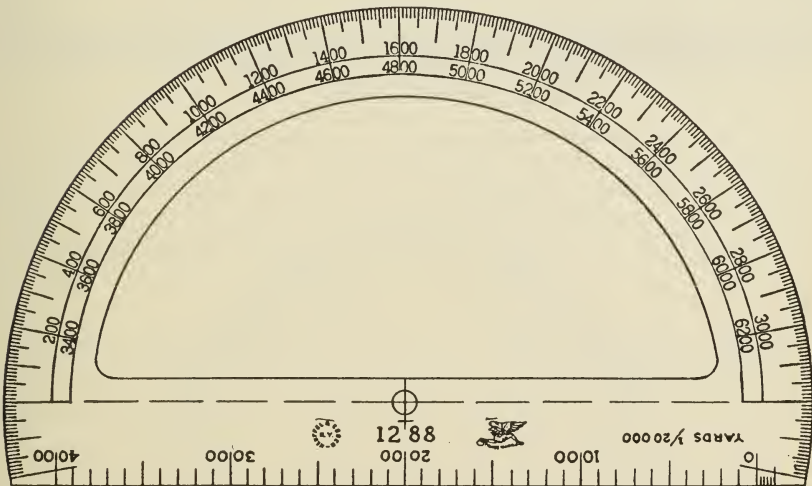


No.
1285.

*list
AKH*

1285. Rectangular Xylonite (transparent) Protractor, $6 \times 1\frac{3}{4}$ in., beveled edges, graduated to degrees. Scales, 1, 3 and 6 in. to the mile, reading to yards. Scale of inches in tenths. Lower edge has slope scales. each
- No. 1285 is old No. N1305.

MIL PROTRACTOR



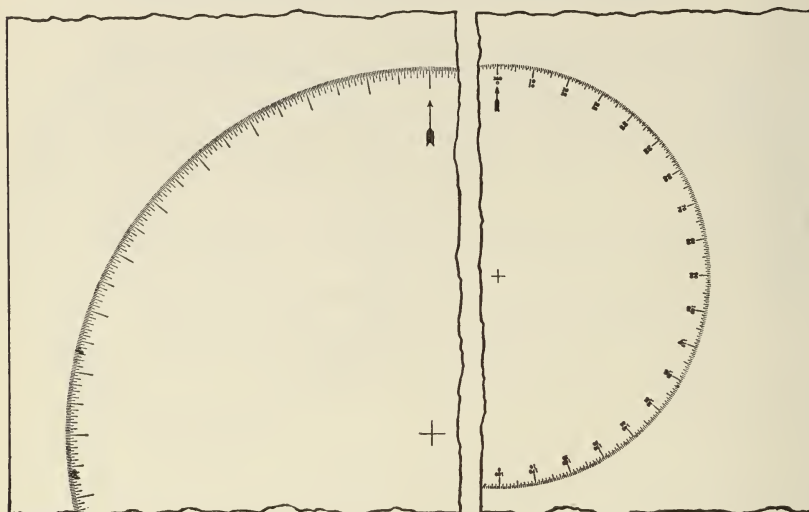
*list
AKH*

1288. Semicircular Xylonite (transparent) Mil Protractor, $8\frac{1}{2}$ inches . . each

No. 1288 is graduated in mil (1/6400 part of the circumference) with the smallest graduation 10 mil, numbered every 200 mil from left to right reading from 0 to 3200 and having a second row of numbers also from left to right reading from 3200 to 6400. The base is divided in yards to the scale of 1/20,000.

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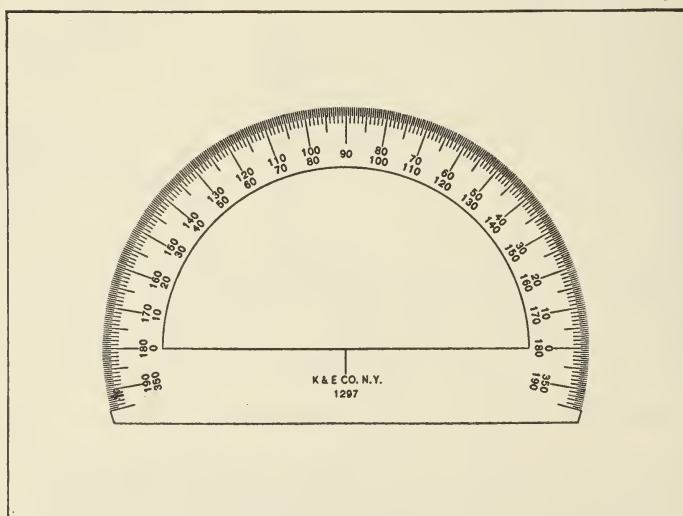
PAPER PROTRACTORS.



No. 1295

1296 $\frac{1}{2}$

1295. Bristol Board, Circular, 14 in. diam. div. $\frac{1}{4}^{\circ}$, Sheet $16\frac{1}{2} \times 22$ in., . . each
 1295 $\frac{1}{2}$. Bristol Board, Circular, 14 " " " $\frac{1}{4}^{\circ}$ " $16\frac{1}{2} \times 22$ "
 outer row numbered 0 to 360, inner row in quadrants, "
 1296. Bristol Board, Circular, 8 in. diam. div. $\frac{1}{2}^{\circ}$, Sheet 12×14 in., . . "
 1296 $\frac{1}{2}$. Bristol Board, Circular, 8 " " " $\frac{1}{2}^{\circ}$ " 12×14 "
 outer row numbered 0 to 360, inner row in quadrants, "



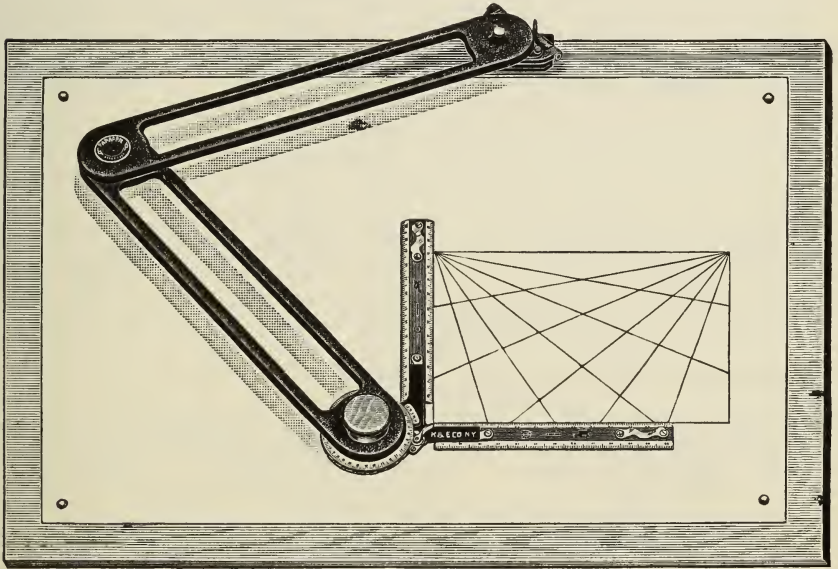
1297. Bristol Board, Semicircular, 5 in. diam. div. $\frac{1}{2}^{\circ}$, Sheets $5\frac{1}{4} \times 7$ in., two
 rows of numbers 0 to 180 in opposite directions each

KEUFFEL & ESSER CO., NEW YORK

K & E
REG. U. S. PAT. OFF.

PARAGON DRAFTING MACHINE

REG. U. S. PAT. OFF.



No. 1370

The Paragon Drafting Machine has been designed to expedite the manual work, and to increase the accuracy, of drafting. It is so designed that the tools which the draftsman handles most frequently are embodied, in principle, in one unit; which obviates the necessity of reaching about for a required tool, and thus enables the draftsman to keep his attention concentrated directly upon the drawing.

The machine itself is composed of two light weight arms, adequately jointed; a protractor, 4 inches in diameter, divided to degrees, reading by vernier to 5 minutes; and two Paragon scales with graduated edges. All moving parts work in ball bearings, insuring ease of movement.

The two arms are so controlled, that the scales, whatever their angle, are given parallel motion over all parts of the drawing. A spring counter balance prevents accidental movements, due to gravity, for any angle of inclination of the board up to 15 degrees.

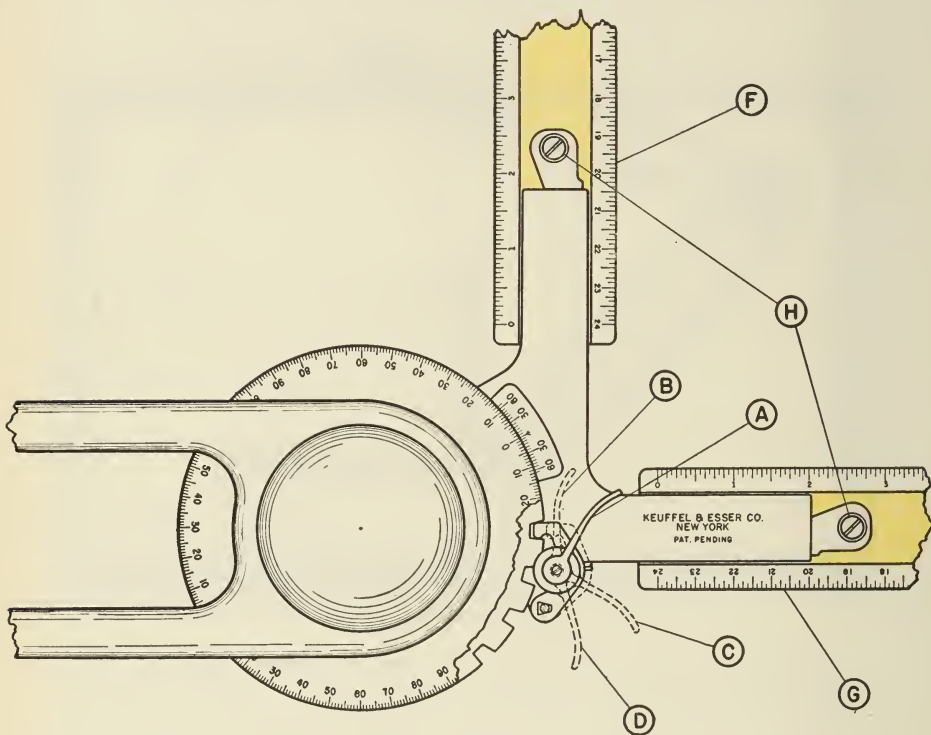
The protractor allows the scales to be set and locked at any angle, or to move freely in angular displacement, or to stop automatically at every 15 degrees.



K & E
REG. U. S. PAT. OFF.

PARAGON DRAFTING MACHINE

REG. U. S. PAT. OFF.



The locking and stop mechanism is operated by a single lever, convenient to the left thumb of the operator, without removing the hand from the knob which controls the movements of the entire instrument. This lever is shown in its normal position at (A). When the lever is pressed to (B) the scales may be rotated freely to any angular position; the release of the lever locking the protractor at the nearest even 15 degree position—that is, at 15, 30, 45, etc. degrees. With the lever pressed to (C) the scales may be freely set to any angle (read by vernier); a slight pressure on the lever to (D) locking the scales in the selected position.

The vertical scale (F) and horizontal scale (G) may be adjusted at right angles to one another by means of the screws (H); consequently, any number of scales may be thus adjusted to be used interchangeably.

The scales are of the well known Paragon quality. Two or more scales are required; and these are so constructed that they may be quickly and easily attached, and as readily removed. An adjustment at the anchor provides means for aligning the scales with the base line of the drawing.

1370. Paragon Drafting Machine, with ball-bearing joints, for drawings up to 36×60 inches, without scales each



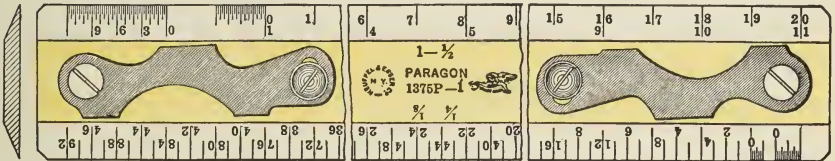
K & E

REG. U. S. PAT. OFF.

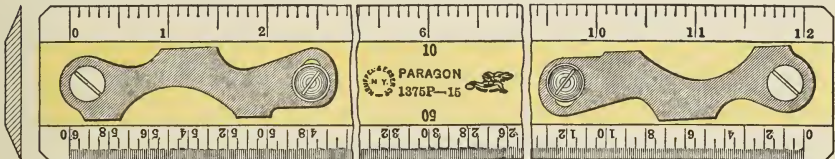
PARAGON DRAFTING MACHINE

REG. U. S. PAT. OFF.

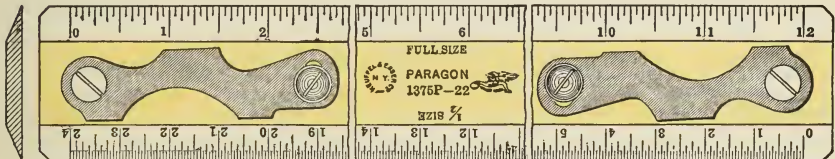
SCALES



No. 1375P-1



No. 1375P-15.



No. 1375P-22

1375P-1.	Paragon Scale,	$\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$ and 1 inch to the foot.	each
1376P-1.	"	12 in.	"
1375P-2.	Paragon Scale,	$\frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$ and 3 inches to the foot.	"
1376P-2.	"	12 in.	"
1375P-7.	Paragon Scale,	$\frac{1}{8}$ and $\frac{1}{4}$ inch to the foot.	"
1376P-7.	"	12 in.	"
1375P-8.	Paragon Scale,	$\frac{3}{8}$ and $\frac{3}{4}$ inch to the foot.	"
1376P-8.	"	12 in.	"
1375P-9.	Paragon Scale,	$\frac{1}{2}$ and 1 inch to the foot.	"
1376P-9.	"	12 in.	"
1375P-15.	Paragon Scale,	10 and 50 parts to the inch.	"
1376P-15.	"	12 in.	"
1375P-16.	Paragon Scale,	20 and 40 parts to the inch.	"
1376P-16.	"	12 in.	"
1375P-17.	Paragon Scale,	30 and 60 parts to the inch.	"
1376P-17.	"	12 in.	"
1375P-22.	Paragon Scale,	$\frac{1}{2}$ and Full Size in inches.	"
1376P-22.	"	12 in.	"
1375P-25.	Paragon Scale,	$\frac{1}{2}$ and Full Size, Metric	"
1376P-25.	"	12 in.	"



K & E
REG. U. S. PAT. OFF.

SCALES AND RULES.

PARAGON AND BOXWOOD SCALES.

REG. U. S. PAT. OFF.

MACHINE-DIVIDED, U. S. STANDARD

The U. S. Standard machine-divided Paragon and Boxwood Scales manufactured by us, are of the best selected material, of proper width and thickness, and of finest finish. They are for quality and accuracy superior to any others on the market.

Although a very large assortment of scales is listed and carried in stock

SPECIAL SCALES TO ORDER

are often required. To avoid error and tedious and delaying correspondence, directions are given for ordering such scales, as follows:

Scales are divided in two distinctly different ways. They may be “open divided” or they may be “full divided”, often known as “Chain Scale”.

OPEN DIVIDED SCALES

are illustrated under *A*, *B*, *C*. They are generally used in architectural or mechanical drawing, and are divided into inches or parts of inches, which represent feet or full inches. The units are marked along the whole length of the edge and only the end units are subdivided into inches and fractions.

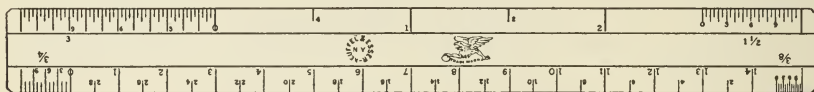


Fig. A.

Fig. A represents an open divided Scale with **four different divisions**, two on each edge. Two of these divisions are numbered to read from the right, the other two from the left. (When two divisions are to be placed on one edge, one must be the double of the other, as $\frac{1}{2} \times \frac{1}{4}$, $\frac{3}{8} \times \frac{1}{4}$, 2×4 , etc.)

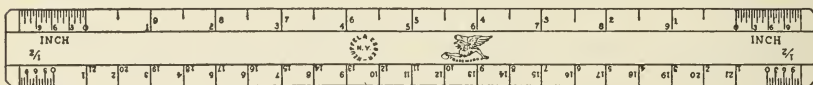


Fig. B.

Fig. B represents an open divided Scale with **two different divisions**, one on each edge; each edge reading from right to left and from left to right.

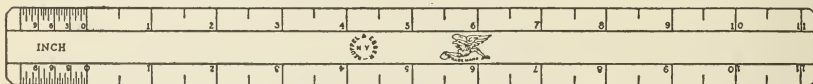


Fig. C.

Fig. C represents an open divided Scale with **only one division**, the same on both edges; one edge reads from right to left, the other from left to right.

Blank for ordering special scales.
ADDITIONAL BLANKS WILL BE FURNISHED ON REQUEST

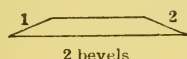
KEUFFEL & ESSER CO.

ORDER FOR SPECIAL SCALES.

Please read all questions and answer all that apply to the scale wanted.

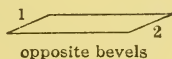
Flat Scales.

What style of blank is to be used?



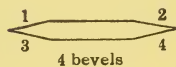
Paragon ☐

Boxwood ☐



Paragon ☐

Boxwood ☐



Paragon ☐

Boxwood ☐

What is length of scale to be? (State length of graduated part, not of the blank, unless special length blank is wanted.)

How is each edge to be graduated? (See style of graduations, page 208 of Catalogue.)

Style A B C D E

Check ☐ ☐ ☐ ☐ ☐

Edge 1.

“ 2.

“ 3.

“ 4.

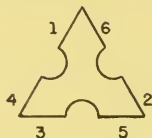
Remarks

It is always safest to send a sketch. This need not be accurate if the *value* of the divisions (units) is stated and the divisions and numberings are indicated. The divisions and numbering will be made in the customary manner, unless otherwise ordered, in which case a sketch must accompany the order.

OVER

Triangular Scales.

What style of blank is to be used?



Boxwood ☐



Paragon ☐

What is the length of the scale to be? (State length of graduated part, not of the blank, unless special length blank is wanted.)

How is each edge to be graduated? (See style of graduations, page 208 of Catalogue).

Style	A	B	C	D	E
Check	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Edge 1.

" 2.

" 3.

" 4.

" 5.

" 6.

Remarks.....

.....

.....

.....

It is always safest to send a sketch. This need not be accurate if the *value* of the divisions (units) is stated and the divisions and numberings are indicated. The divisions and numbering will be made in the customary manner, unless otherwise ordered, in which case a sketch must accompany the order.

OVER



Hence, in ordering open divided Scales it is necessary to specify the following: that they are to be open divided; length, shape and material; how many different divisions are wanted; which division on each edge; and whether the numbers should read from right to left, or from left to right or both ways. Of course, they can read both ways only when there is but one division on each edge. If other than the usual numbering is wanted, this must also be explained in the order.

FULL DIVIDED OR CHAIN SCALES

are those on which equal divisions and subdivisions are carried along the whole length of the divided part. Therefore, only one kind of division can be made on one edge. They are generally divided into decimals of inches or feet, with continuous numbering every 10 divisions, a system used by **Surveyors** and **Civil Engineers**; but they can be divided inches to the foot, as shown in figure *E*.



Fig. *D*.

Fig. *D* represents a Chain Scale with **two different divisions**, one on each edge, each of which reads **from right to left and from left to right** (both ways).



Fig. *E*.

Fig. *E* represents a Chain Scale with **two different divisions**, one on each edge, each of which reads **from left to right**.

Hence, in ordering Chain Scales it is necessary to specify the following: that they are to be Chain Scales; length, shape and material; which divisions are wanted; how they are to be numbered; and whether the numbers should read from right to left, or from left to right, or both ways.

The price of special scales to order depends upon so many factors, that it is not feasible to give any directions for estimating their cost. A price will be quoted on receipt of an accurate description of the scale wanted.

The safest way to order a **Special Scale** is to use the printed forms for ordering scales, which are furnished on request. In the absence of a printed form, state material, shape and length of scale wanted, and send a sketch showing divisions and numbering. It is not necessary that the sketch should show correct or actual divisions, if the value of the divisions (in inches, etc.) is stated and the divisions and numberings are indicated.

Bevels on opposite sides.

Any of our flat scales can be furnished with the two bevels on opposite sides; and some of the more frequently used scales of this style are carried in stock. (See No. 1391PR. &c.)

Scales with special divisions, and in foreign measures, made to order.



FLAT PARAGON SCALES

REG. U. S. PAT. OFF.

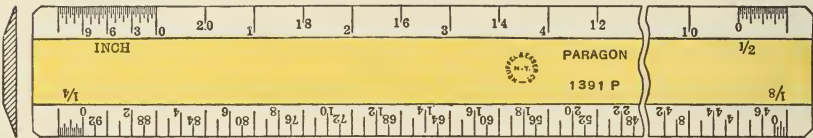
MACHINE DIVIDED

OPEN DIVIDED

Each Scale Stamped "Paragon".

Paragon Scales are made of the best seasoned Boxwood. The bevels are covered with a material resembling ivory, which will permanently remain white and is not liable to shrink. They combine durability and distinctness, and will not tire nor injure the eyes.

Two Bevels

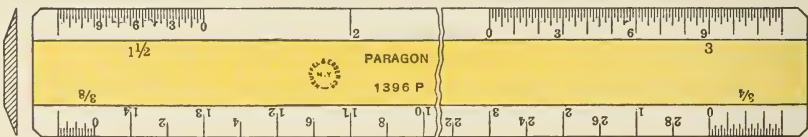


No. 1391 P.

1390 P.	Flat Paragon Scale, 6 in. div.	$\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 in. to the foot,	. . . . each
1391 P.	"	12 " " " " " " " " " " " " "
1391 PA.	"	12 " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{3}{4}$ " " " " " " "
1391 PB.	"	12 " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{4}$, $1\frac{1}{2}$ " " " " " " "
1392 P.	"	$12\frac{1}{2}$ " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 " " " " " " "

Scale No. 1392P has the advantage of covering 100 feet on $\frac{1}{8}$ inch, 50 feet on $\frac{1}{4}$ inch, and 25 feet on $\frac{1}{2}$ inch scale.

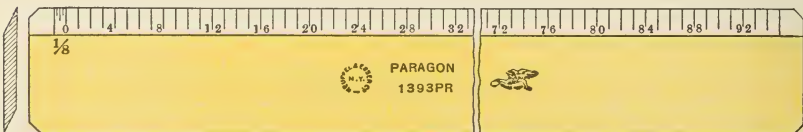
1394 P. Flat Paragon Scale, 24 in., div. $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 in. to the foot, "



No. 1396 P.

1396 P. Flat Paragon Scale, 12 in. div. $\frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$, 3 in. to the foot, each

Bevels on Opposite Sides.



No. 1393 PR.

1391 PR.	Flat Paragon Scale, 12 in., div.	$\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 in. to the foot,	. . . . each
1393 PR.	do.	" " " $\frac{1}{8}$, $\frac{1}{4}$ in. to the foot, "



PARAGON SCALES, OPEN DIVIDED

REG. U. S. PAT. OFF.

Each Scale Stamped "Paragon".

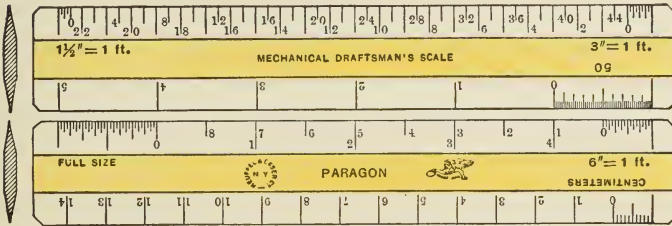
MECHANICAL DRAFTSMAN'S SCALES

Copyright 1924 by

S. H. LOTT, M. E.

Head of the Mechanical Drawing Division,
Department of Machine Design, Stevens Institute of Technology.

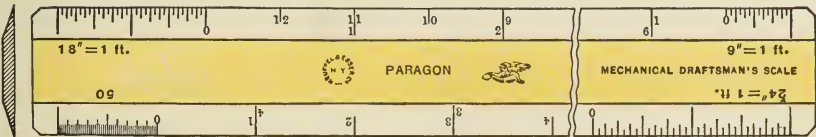
Both sides Beveled and divided.



1397P-1.

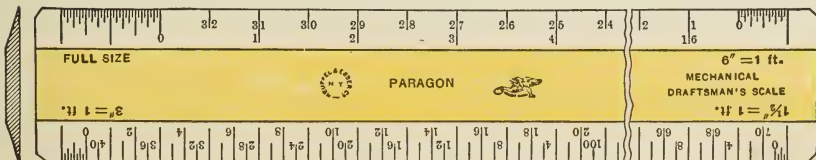
- 1397P-1.** Flat Paragon Mechanical Draftsman's scale, 6 in., open divided, $1\frac{1}{2}$, 3, 6 in.=1 ft., full size, 50 parts to the inch, centimeters and millimeters. In leather sheath. . . . each
- For use as a pocket scale and also for small work on the drafting board. End divisions subdivided $1\frac{1}{2}$ "=1 ft. into four parts; 3"=1 ft. into eight parts; 6"=1 ft. into sixteen parts; full size into thirty-two and fifty parts; centimeters into millimeters.

Two Bevels.



1397P-2.

- 1397P-2.** Flat Paragon Mechanical Draftsman's scale, 12 in., open divided 24, 18, 9 in.=1 ft., full size, fifty parts to the inch . . . each
- End divisions subdivided 9"=1 ft. into sixteen parts; 18" and 24"=1 ft., into thirty-two parts; full size into fifty parts.

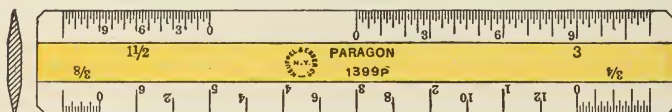


1397 P-3.

- 1397P-3.** Flat Paragon Mechanical Draftsman's scale, 18 in., open divided, $1\frac{1}{2}$, 3, 6 in. = 1 ft., full size each
- Advantageous for large dimensions, since it saves the trouble of re-setting. End divisions subdivided $1\frac{1}{2}$ "=1 ft., into four parts; 3"=1 ft., into eight parts; 6"=1 ft. into sixteen parts; full size into thirty-two parts.

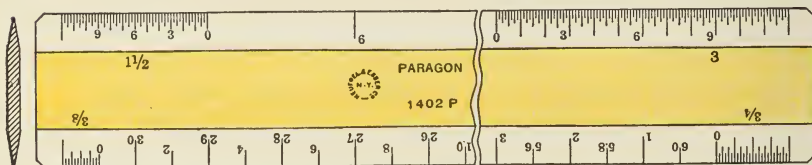
REG. U. S. PAT. OFF.

Both sides beveled and divided.



No. 1399 P.

Scale 1399 P is less than one inch wide and very convenient for the pocket. It has all the usual scales employed by the building professions.

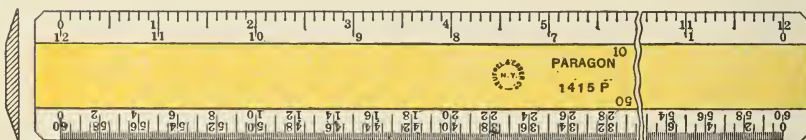


No. 1402 P.

1400 P. Flat Paragon Scale, 12 in., div. $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, $1 \times \frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$, 3 in. to foot, . . . each
1402 P. " 24 " " " " " " " " " " " " " " " " "

REG. U. S. PAT. OFF.

Two Bevels.



No. 1415 P.

1410 P.	Flat Paragon Chain Scale	6 in., div.	10×50	parts to the inch,	. . . .	each
1411 P.	do.	6 "	20×40	" "	" "	"
1412 P.	do.	6 "	30×60	" "	" "	"
1413 P.	do.	6 "	80×100	" "	" "	"
1415 P.	do.	12 "	10×50	" "	" "	"
1416 P.	do.	12 "	20×40	" "	" "	"
1417 P.	do.	12 "	30×60	" "	" "	"
1418 P.	do.	12 "	80×100	" "	" "	"

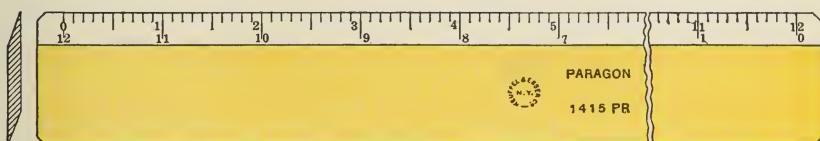


PARAGON CHAIN SCALES.

REG. U. S. PAT. OFF.

Each Scale Stamped "Paragon".

Bevels on opposite sides.



No. 1415 PR.

- *1415 PR. Flat Paragon Chain Scale, 12 in. div. 10×50 parts to the in., each
- *1416 PR. do. 12 " " 20×40 " " " " "
- *1417 PR. do. 12 " " 30×60 " " " " "
- *1418 PR. do. 12 " " 80×100 " " " " "

Both sides beveled and divided.

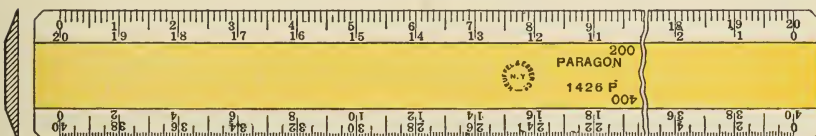


No. 1419 P.

- 1419 P. Flat Paragon Pocket Scale, 6 in., div. 10, 40, 30 and 50 parts to the inch; in leather Sheath. each
- 1420P. do. do. 6 in., div. 10, 20, 40 and 50 parts to inch; in leather Sheath. "

Scales 1419P and 1420P are less than one inch wide and very convenient for the pocket.

Two Bevels.



No. 1426 P.

- *1425 P. Flat Paragon Chain Scale, 12 in., div. 100×500 parts to the foot, each
- *1426 P. do. 12 " " 200×400 " " " " "
- *1427 P. do. 12 " " 300×600 " " " " "
- *1428 P. do. 12 " " 800×1000 " " " " "
- 1430 P. do. 6 " " 2 in. to the mile (smallest division representing 100 ft.) and 4 in. to the mile (smallest division representing 20 ft.)

*Made to order only.

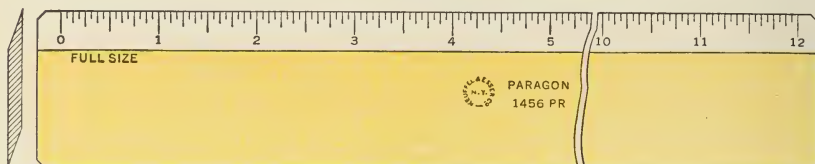


PARAGON CHAIN SCALES.

REG. U. S. PAT. OFF.

Each Scale Stamped "Paragon".

Bevels on opposite sides.



No. 1456 PR.

1453 PR. Flat Paragon Chain Scale 12 in. div. 16×32 parts to the inch, . . each

1456 PR. do. 12 " div. one edge full size in inches,
the other edge half size in inches "

1457 PR. do. 12 in. div. one edge half size in inches,
the other edge one-quarter size in inches . . . "

Two Bevels.



No. 1462 P.

1460 P. Flat Paragon Scale, 10 cm., div. mm. and half mm. each

1461 P. do. 20 " " " " " " "

1462 P. do. 30 " " " " " " "

1463 P. do. 50 " " " " " " "

Two Bevels.

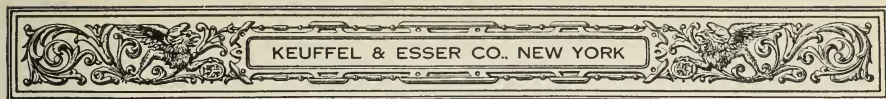


No. 1472 P.

1472 P. Flat Paragon Scale, 30 cm., div. 32nds. in. and half mm., . . . each

1473 P. do. 50 " " " " " " "

These scales are divided into inches on one edge and into metric measure on the other, which makes them very convenient for converting plans from one system into the other.

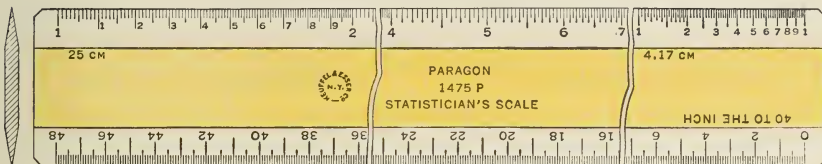


PARAGON SCALES.

REG. U. S. PAT. OFF.

Each Scale Stamped "Paragon".

Both sides beveled and divided



No. 1475P.

1475P. Flat Paragon Scale, 12 in. divided:

1st edge, 2 complete logarithmic scales, one 25 cm. long, one $4\frac{1}{2}$ cm. long,

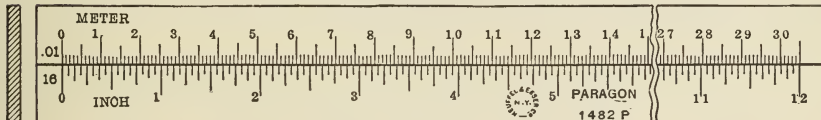
2nd edge, 3 complete logarithmic scales, one $12\frac{1}{2}$ cm. long, one 10 cm. long, one $6\frac{1}{2}$ cm. long,

3rd edge, 30 centimeters, subdivided to millimeters.

4th edge, 12 inches subdivided to 40ths of inches. . . each

No. 1475P. has been designed for use of Statisticians.

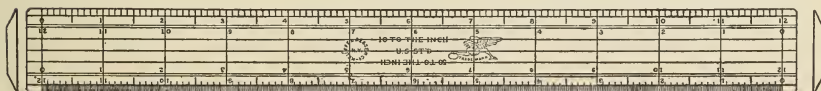
METRIC COMPARING SCALES.



No. 1482P.

1482P. Flat Paragon Scale, (white facing) 30 cm., inch and metric comparing scale, div. mm. and 16ths in. on median line (no bevels) each

UNDERWRITER'S SCALES.



No. 1487.

1486. Underwriter's Scale, flat, transparent xylonite, 6 in., both edges beveled, one edge divided 10 parts to the inch, the other 50 parts to the inch; the inch graduations are carried across the scale each

1486½. Like 1486, but both edges divided 10 parts to the inch. "

1487. Underwriter's Scale, flat, like No. 1486, but 12 in. "

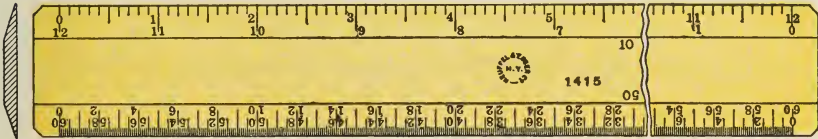
1487½. Like 1487, but both edges divided 10 parts to the inch. "

For Flat Paragon Scales, see page 210 etc.



BOXWOOD CHAIN SCALES.

Two Bevels.



No. 1415.

1410.	Flat Boxwood Chain Scale,	6 in.,	div. 10×50	parts to the inch,	. . . each
1411.	do.	do.	6 " "	20×40 " " " "	"
1412.	do.	do.	6 " "	30×60 " " " "	"
1415.	do.	do.	12 " "	10×50 " " " "	"
1416.	do.	do.	12 " "	20×40 " " " "	"
1417.	do.	do.	12 " "	30×60 " " " "	"

Both sides beveled and divided.



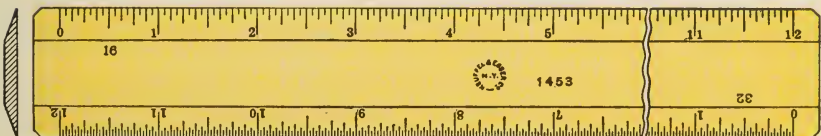
No. 1419.

1419.	Flat Boxwood Pocket Scale,	6 in.,	div. 10, 40, 30 and 50	parts to the inch; in leather Sheath,	. . . . . each
1420.	Flat Boxwood Pocket Scale,	6 in.,	div. 10, 20, 40 and 50	parts to the inch; in leather Sheath,	. . . . . each

Scales 1419 and 1420 are less than one inch wide and very convenient for the pocket.

MISCELLANEOUS DIVISIONS

Two Bevels.



No. 1453.

1450.	Flat Boxwood Chain Scale,	12 in.,	div. 10×12	parts to the inch,	. . each
1452.	do.	do.	12 " "	12×16 " " " "	"
1453.	do.	do.	12 " "	16×32 " " " "	"
1454.	do.	do.	12 " "	32×64 " " " "	"



BOXWOOD CHAIN SCALES.

Two Bevels.



No. 1462.

DIVIDED: METRIC

1460.	Flat Boxwood Scale,	10 cm. div. mm. and half mm.	each
1461.	do.	20 " " " " " " "	"
1462.	do.	30 " " " " " " "	"
1463.	do.	50 " " " " " " "	"

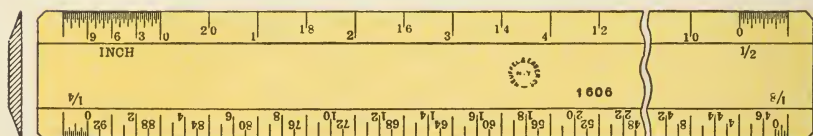
DIVIDED: ENGLISH AND METRIC

1480.	Flat Boxwood Chain Scale	6 in., div. 16ths in. × mm.	each
1481.	do.	do. 12 " " " " × "	"

PLAIN BOXWOOD SCALES.

OPEN DIVIDED.

Two Bevels.



No. 1606.

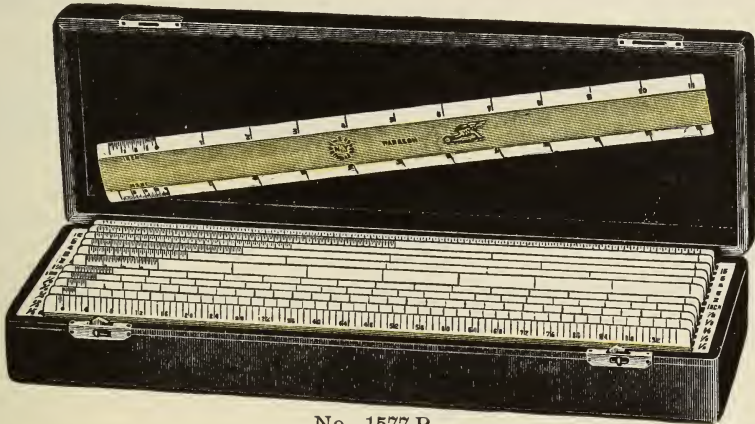
1605.	Flat Boxwood Scale,	6 in., div. $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 in. to the foot . . .	each
1606.	do.	12 " " " " " " " " " . . .	"

KEUFFEL & ESSER CO. NEW YORK

PARAGON SCALES IN SETS.

REG. U. S. PAT. OFF.

Flat Scales in Sets represent the most perfected form of Draftsman's Scales. They are put up and arranged in a manner that makes their use practical, time saving, and economical. The Scales are arranged, as the illustration shows, in a neat and strong leather covered case with a separate space for each scale plainly numbered so that the scale of the desired division can be found at a glance. In this manner the scales, which are as valuable and more delicate than compasses and dividers, are as well protected as the latter.



No. 1577 P.

OPEN DIVIDED.

Each Scale has the same division on both edges, one edge reading from left to right, the other edge from right to left. See figure C, page 208.

- 1575 P. Set of 4 Paragon Scales, 12 in.
divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 inch to the foot set
- 1576 P. Set of 8 Paragon Scales, 12 in.
divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 inches to the foot “
- 1577 P. Set of 12 Paragon Scales, 12 in. divided:
 $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4, 6 in. to the ft. and $\frac{1}{16}$ in. full size “

CHAIN SCALES.

Each Scale has two different divisions, one on each edge, each of which is numbered to read both ways. See figure D, page 208.

- 1584 P. Set of 4 Paragon Scales, 12 in.
divided: 10, 20, 30, 40, 50, 60, 80, 100 parts to the inch . set
- Each Scale has only one division, the same on both edges, and is numbered to read both ways on each edge.
- 1592 P. Set of 6 Paragon Scales, 12 in.
divided: 10, 20, 30, 40, 50, 60 parts to the inch set
- 1593 P. Set of 8 Paragon Scales, 12 in.
divided: 10, 20, 30, 40, 50, 60, 80, 100 parts to the inch. “

METRIC SCALES.

- 1598 P. Set of 6 Paragon Scales, 30 cm.
divided metric measure: .01, .02, .03, .05, .025, .0125 “

REG. U. S. PAT. OFF.

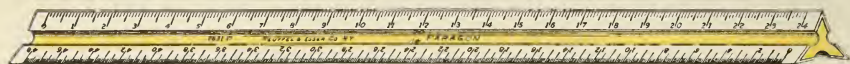
The diagram compares two shapes of a three-pointed tool, likely a divider or a similar drafting instrument. On the left, labeled 'Improved shape', is a yellow-colored tool with a central rectangular body and three pointed ends. On the right, labeled 'Usual shape', is a black-and-white line drawing of a similar tool. Between the two tools is a horizontal ruler with markings from 0 to 12. The ruler has the text 'W. H. E. F. F. L. E. S. S. E. R. C. O. N.' printed on it. The ruler is positioned such that the tools are aligned with the markings, showing the relative lengths and proportions of the two shapes.

Each Scale Stamped "Paragon."



No. 1621 P.

1620 P. 6 in., div. $\frac{3}{8}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 in. to the foot, $\frac{1}{16}$ in., each
 1621 P. 12 " " " " " " " " " " " " " " " " "
 1622 P. 12 " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4 " " " " " " "
 1623 P. 18 " " " " " " " " " " " " " " " "
 1624 P. 24 " " " " " " " " " " " " " " " "



No. 1631 P.

1630 P.	6 in.,	div. 10, 20, 30, 40, 50, 60	parts to the inch	. . .	each
1631 P.	12 "	" " " " " " " " " "	" " " " " " " " " "	. . .	"
1632 P.	18 "	" " " " " " " " " "	" " " " " " " " " "	. . .	"
1633 P.	24 "	" " " " " " " " " "	" " " " " " " " " "	. . .	"
1634 P.	12 "	" " 20, 30, 40, 50, 60, 80	" " " " " " " " " "	. . .	"

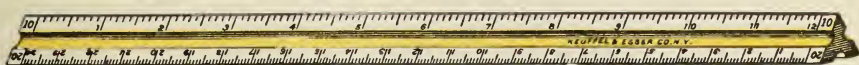
1645 P.	20 cm.,	div.	.01	.02	.03	.05	.025	.0125	each
1655 P.	30 "	"	"	"	"	"	"	"	"
1665 P.	50 "	"	"	"	"	"	"	"	"

MACHINE DIVIDED



No. 1621W.

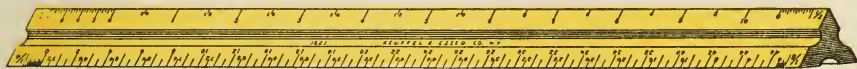
1620 W. 6 in., div. $\frac{3}{32}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 in. to the foot, $\frac{1}{16}$ in., each
1621 W. 12 " " " " " " " " " " " " " " " " " "
1622 W. 12 " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4 " " " " " " " "



No. 1631 W.

1630 W. 6 in., div. 10, 20, 30, 40, 50, 60 parts to the inch . . . each
1631 W. 12 " " " " " " " " " " " " " " . . . "

TRIANGULAR BOXWOOD SCALES.



No. 1621.

1620.	6 in. div.	$\frac{3}{2}$, $\frac{7}{6}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{3}{2}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 in. to the foot,	$\frac{1}{8}$ in., each
1621.	12 " "	" " " " " " " " " " " " " " " " " " " "	" " " "
1621 M.	12 " "	$\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 in. to the foot,	
		50 parts to the inch,	$\frac{1}{8}$ in. "
1622.	12 " "	$\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4 " " " " " " " "	" " " "



No. 1631.

1630.	6 in.,	div. 10, 20, 30, 40, 50, 60	parts to the inch	. . .	each
1631.	12 "	" " " " " " " " " "	" " " " "	. . .	"
1634.	12 "	" 20, 30, 40, 50, 60, 80	" " " " "	. . .	"



METRIC TRIANGULAR SCALES. (Boxwood.)



No. 1655.

1645. Triangular Boxwood Scale, 20 cm., div. .01 .02 .03 .05 .025 .0125 . . each
 1655. do. 30 “ “ “ “ “ “ “ “
 *1665. do. 50 “ “ “ “ “ “ “ “

*Made to order only.

Triangular Scales of any style with any divisions, and in foreign measures, made to order. See page 208.

SHEATH FOR TRIANGULAR SCALES.

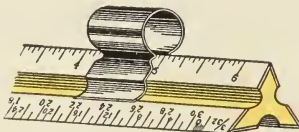
In ordering, please state whether for Paragon, White Edge or Plain Boxwood Scale.

- 1668 A. Sheath for 6 in. scale each
 B. do. 12 “ “ “
 C. do. 18 “ “ “
 D. do. 24 “ “ “

No. 1668 is old No. 1619.

These sheaths are of stout cardboard, lined with velvet.

SCALE GUARD.



No. 1669.

1669. Scale Guard for Triangular Scales, nickel silver each

No. 1669 is old No. N1691.



PROTRACTOR SCALE.



No. 1670

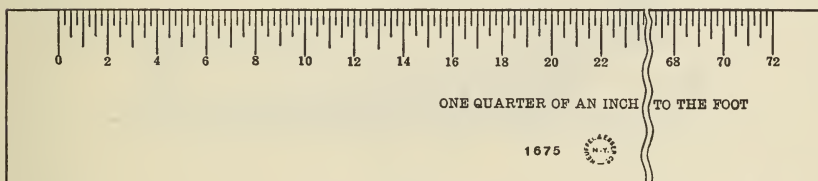
1670. Protractor Scale, steel, bright graduations on black back-ground $5\frac{1}{8} \times 1$ in., one edge graduated in inches to 16ths, the other edge in inches to 10ths, both numbered 0 to 5 inches. Protractor at one end, graduated to 5 degrees from 0 to 90 degrees and numbered at every 20 degrees each 208

PAPER SCALES

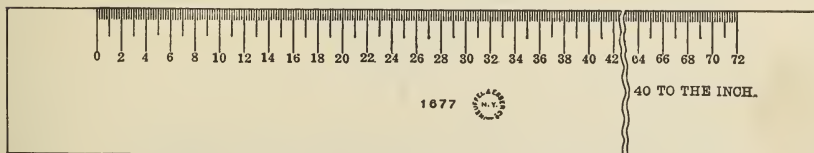
PRINTED ON BRISTOL BOARD FROM ENGINE DIVIDED PLATES.

$19 \times 1\frac{3}{4}$ inches.

(Each scale has only one division, except No. 1678.)



1675. Set A, 6 in Set, div. $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 in. to the foot, set 110
 1675S. Separate Scales, any of the above each 208

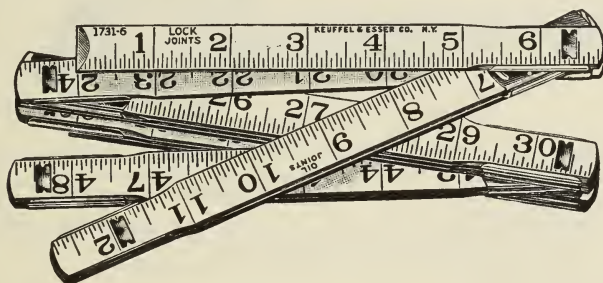


1677. Set C, 6 in set, div. 10, 20, 30, 40, 50, 60 parts to the inch, set 110
 1677S. Separate Scales, any of the above each 208



FOLDING POCKET WOOD RULES

SPRING JOINTS, HARDWOOD, $\frac{5}{8}$ IN. WIDE.

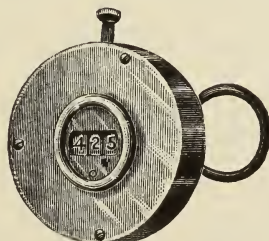


No. 1731

"BLACK END" FOLDING RULES, equal in quality to any folding rules on the market, with strong steel springs in their joints, additional locking devices at the joints, and strike plates on the surface of all members which protect the graduations and numbers against the rubbing of adjacent members.

1731-4.	Pocket Rule, Yellow Finish,	4 ft.,	8 fold,	div.	$\frac{1}{16} \times \frac{1}{16}$ in.,	metal tips each
1731-5.	Pocket Rule,	do.	5 "	10 "	"	$\frac{1}{16} \times \frac{1}{16}$ " " " "
1731-6.	Pocket Rule,	do.	6 "	12 "	"	$\frac{1}{16} \times \frac{1}{16}$ " " " "
1732-4.	Pocket Rule, White Finish,	4 "	8 "	"	"	$\frac{1}{16} \times \frac{1}{16}$ " " " "
1732-5.	Pocket Rule,	do.	5 "	10 "	"	$\frac{1}{16} \times \frac{1}{16}$ " " " "
1732-6.	Pocket Rule,	do.	6 "	12 "	"	$\frac{1}{16} \times \frac{1}{16}$ " " " "
1732-6D.	Pocket Rule,	do.	6 "	12 "	"	$\frac{1}{8}$ in. $\times \frac{1}{10}$ ft. " " "

TALLY REGISTER



No. 1748

1748. Tally Register, for keeping count by pressing on a knob, nickelplated, registers to 999, arranged to set back to zero,
- 1748X. Tally Register, like No. 1748 but registering to 9999,
- Nos. 1748 and 1748X are old Nos. 7854 and 7854X.

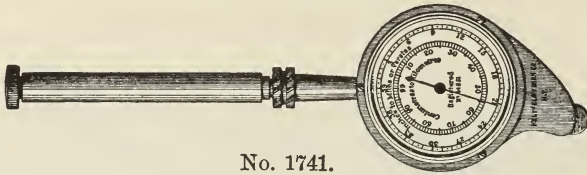
260
each

390

KEUFFEL & ESSER CO. NEW YORK

MAP MEASURES.

(CHARTOMETERS.)

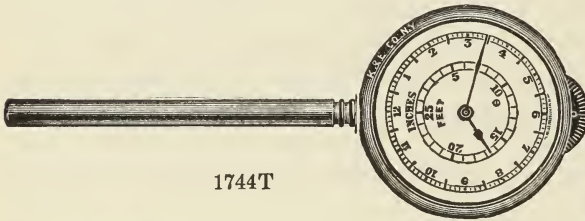


No. 1741.

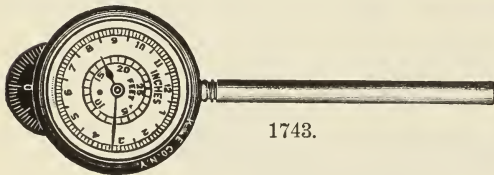
- 1741. Map Measure**, 5 in., swiveling metal handle with lock nut, dial about $1\frac{1}{8}$ in., with 2 graduations; inches up to 39 inches, in $\frac{1}{2}$ inches, and centimeters up to 99 centimeters each

The swiveling handle adapts this instrument to follow accurately along broken and irregular lines.

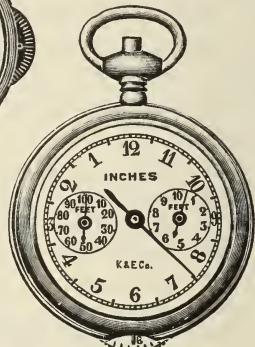
No. 1741 is old No. 1692.



1744T



1743.



1745.

- 1743. Map Measure**, nickelplated, $1\frac{3}{8}$ in. diam., registers 25 feet in feet, inches and eighths inches on the dial; but reads to $\frac{1}{32}$ of an inch on the measuring wheel; long handle each

No. 1743 is old No. 1694A.

- 1744T. Map Measure**, graduated like No. 1743, but $1\frac{1}{2}$ in. diam.; long handle “

No. 1744T is old No. 1694B.

- 1744D. Map Measure**, nickelplated, similar to No. 1744T, registers 25 feet in feet, inches and tenths of inches on the dial; but reads to .05 inch on the measuring wheel; long handle “

No. 1744D is old No. 1694D.

- 1745. Map Measure**, watch pattern, nickelplated, $1\frac{3}{4}$ in. diam., three numbered dials, registers 100 feet in feet, inches and eighths inches on the dial, and $\frac{1}{32}$ of an inch on the measuring wheel, with device for setting back to zero; with directions “

No. 1745 is old No. 1695.

To measure a line, the instrument is set to zero, and the wheel is run over the map, (the instrument being held perpendicularly) following closely the line or distance to be measured. The index hands on the dial will then indicate the length of the line in feet, inches and eighths or tenths inches; while the measuring wheel reads to $\frac{1}{32}$ or .05 of an inch.



PARALLEL RULES.

FOLDING TYPE



No. 1782.

Folding Parallel Rule, Ebonized Boxwood, Adjustable Nickelplated Brass Bars,

	1780	1782	1783	1784	1785
	6	12	15	18	24 in.
each	175	200	240	280	360



No. 1796.

1796.	Sigsbee's Patent Parallel Rule,	Ebonized Boxwood,	15 in.,	. .	each	725
1797.	"	"	"	"	" 18 "	825
1798.	"	"	"	"	" 24 "	925

Parallel Rules Nos. 1796 to 1798 have nickelplated brass mountings and the bars are so pivoted that the rule can be laid over (stepping) to cover any distance. Rubber disks, inserted in finger holds in the blades, insure additional friction of each blade upon the drawing surface when pressed down by the fingers.

EBONY

Because of the extreme scarcity of real Ebony, the trades using this material have been largely forced to substitute stained woods of various kinds; which, however have retained the designation "Ebony".

K & E Co. have dropped this custom in describing the goods listed in this catalogue; employing the term "Ebony" only where real Ebony is offered. Where a substitute for real Ebony is used, we do not follow the usual custom of designating the substitute as "Ebony"; but indicate that it is a substitute by applying the terms "Ebonized" and "Ebony finish." "Ebonized" is applied to Boxwood alone, and signifies that this material, which is superior in hardness and smoothness to real Ebony, has been treated to give it the desirable black color of some grades of real Ebony. "Ebony finish" is applied only to other hardwoods which have been blackened to represent Ebony in appearance.



K & E
REG. U. S. PAT. OFF.

TRIANGLES

NICKELPLATED STEEL TRIANGLES

1840. Steel Triangles, nickelplated, open center, 30 × 60 degrees,
each 10½ 15 in.

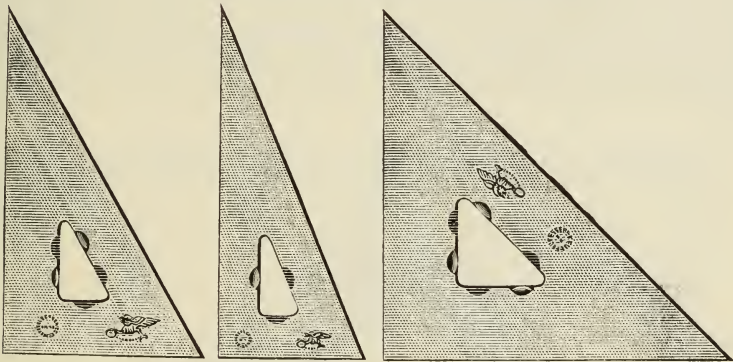
No. 1840 is old No. 2002

1845. Steel Triangles, nickelplated, open center, 45 degrees,
each 8 12 in.

No. 1845 is old No. 2003.

XYLONITE TRIANGLES

The transparent Xylonite which we use in manufacturing our goods, is made especially for such tools, and stands up better than the material generally employed for the purpose.



No. 1855.

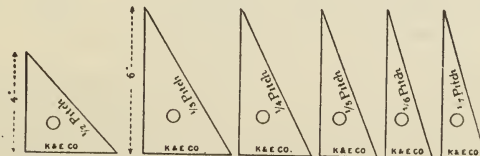
1855-1.

1856.

1855. Improved Xylonite Triangles (transparent), 30 × 60 degrees,
each 4 6 7 8 9 10 12 14 16 18 in.

1855-1. Improved Xylonite Triangles (transparent), 22½ × 67½ degrees,
each 4 6 8 10 12 in.

1856. Improved Xylonite Triangles (transparent), 45 degrees,
each 4 6 7 8 9 10 12 14 16 18 in.



No. 1857 A.

1857A. Xylonite Triangles for roof pitches, 6 in set set

KEUFFEL & ESSER CO., NEW YORK

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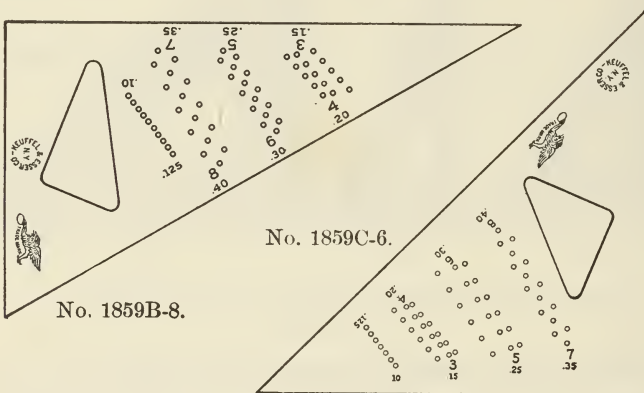
LETTERING TRIANGLES.



No. 1859A.

1859A. Xylonite (Transparent) Lettering Triangle, 6 in., with Directions . . . each
No. 1859A is old No. N1859.

K & E Lettering Triangle No. 1859A has the form of a 6 inch, 45 degree triangle, with one 45 degree corner cut off to form an angle of $67\frac{1}{2}$ degrees. It has a number of oblong, beveled slots, permitting the insertion of a chisel-pointed pencil for the purpose of drawing horizontal guide lines to facilitate lettering. For lower case lettering, the heights of the capital letters are $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$ and 1 inch. The lower case letters are two-thirds the height of the capitals. Standard and close spacing between lines is especially provided for. Slots for spacings of $\frac{1}{16}$ and $\frac{3}{16}$ of an inch are located near the base of the triangle, to admit of lines being drawn by means of these slots along the lower edge of a drawing.



No. 1859C-6.

No. 1859B-8.

- 1859B-5.** Xylonite (transparent) Lettering Triangle, $30^\circ \times 60^\circ$, 5 in., each
1859B-8. Xylonite (transparent) Lettering Triangle, $30^\circ \times 60^\circ$, 8 in., "
1859C-4. Xylonite (transparent) Lettering Triangle, 45° , 4 in., "
1859C-6. Xylonite (transparent) Lettering Triangle, 45° , 6 in., "

Directions furnished with the above triangles.

Nos. 1859B-8 and 1859C-6 are old Nos. 1859-2 and -3.

K & E Lettering Triangles Nos. 1859B and 1859C have a number of groups of counter-sunk holes, which permit the insertion of a sharp pointed pencil for the purpose of drawing horizontal guide lines to facilitate lettering. For lower case lettering the heights of the capital letters are $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$ and 1 inch. The lower case letters are two-thirds the height of the capitals. For lettering consisting entirely of capitals, provision is made for letters .10, .125, .15, .20, .25, .30, .35 and .40 of an inch in height.



CURVES

IRREGULAR CURVES.

See illustration, page 232.

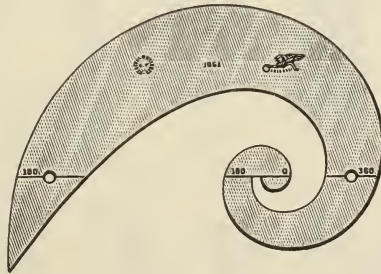
1860. Xylonite (Transparent) Irregular Curves.

Pattern No.		Pattern No.		Pattern No.	
1	each	11	each	21	each
2	"	12	"	22	"
3	"	13	"	23	"
4	"	14	"	24	"
5	"	15	"	25	"
6	"	16	"	26	"
7	"	17	"	27	"
8	"	18	"	29	"
9	"	19	"	30	"
10	"	20	"		

In ordering, please state catalogue and pattern numbers.

LOGARITHMIC SPIRAL CURVE.

(Transparent.)



No. 1861.

1861 Logarithmic Spiral Curve, Xylonite (transparent), 8 in., with Directions each

This curve is constructed on mathematical principles and contains every curve within the limit of its size. It is a tool of large scope and useful also for various calculations. Full Directions are furnished with it.

Book 117. The Logarithmic Spiral Curve. By Wm. Cox. This pamphlet (10 pages) explains the origin of logarithms, describes the method of constructing this curve and illustrates its use by means of several practical examples. . . each

KEUFFEL & ESSER CO., NEW YORK

IRREGULAR (FRENCH) CURVES.

No. 1860 - Xylonite (transparent).

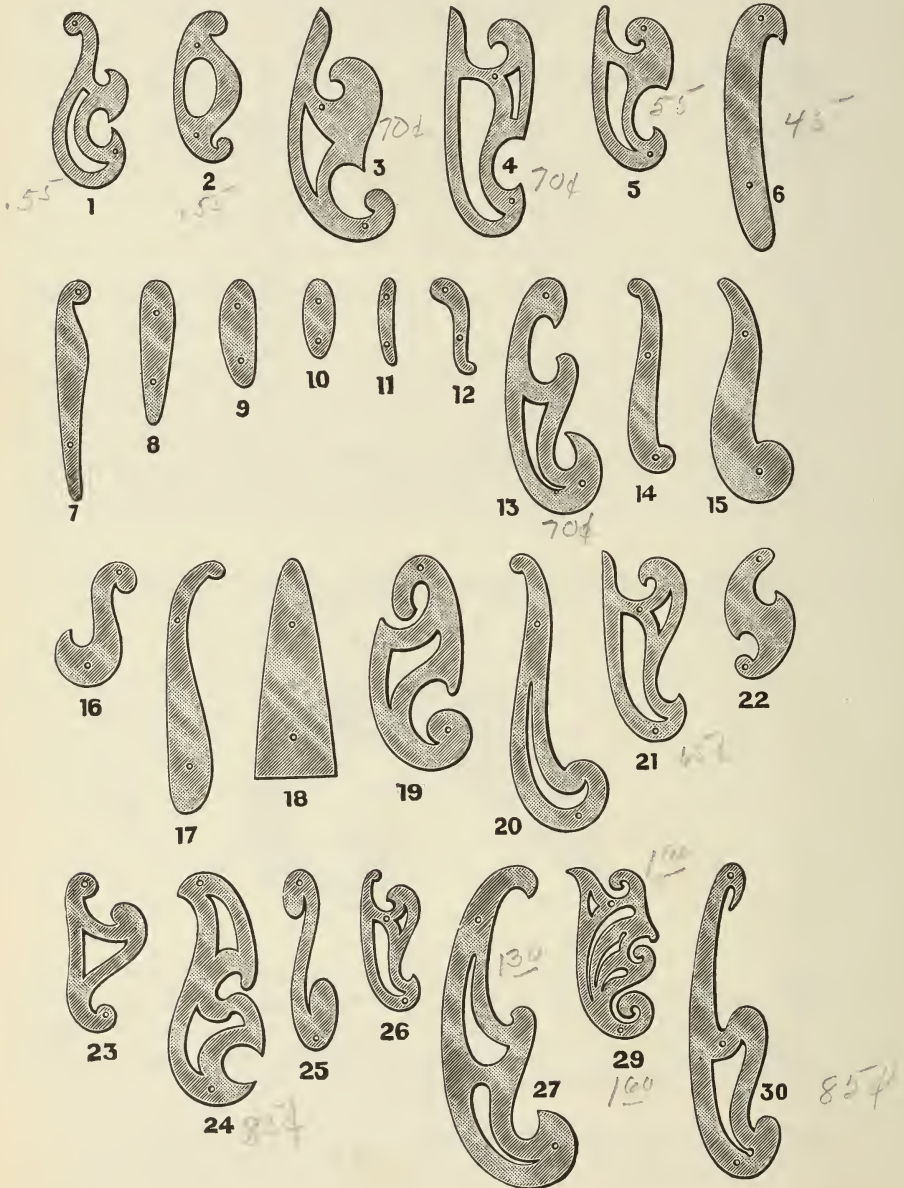
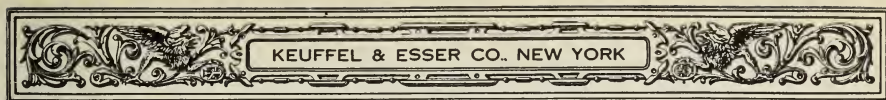
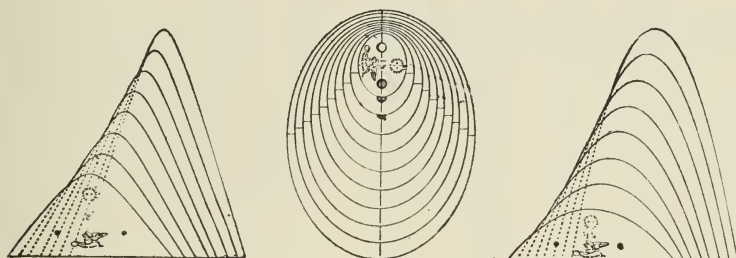


Illustration about $\frac{1}{2}$ size.



ELLIPSES, HYPERBOLAS, PARABOLAS.



No. 1862B.

1862.

1862C.

Xylonite (Transparent)

1862. Xylonite Ellipses, set of 10, major axis, $1\frac{1}{2}$ to 6 in. (increasing by $\frac{1}{2}$ in.) set

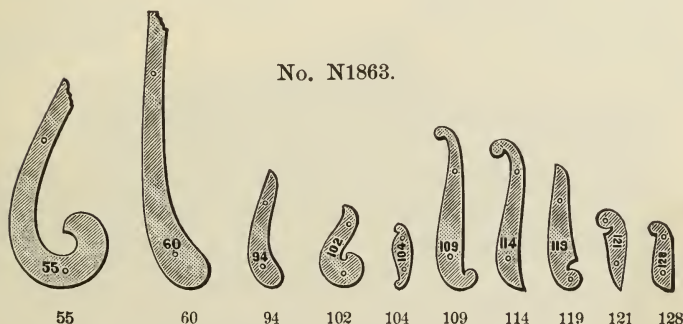
The ratio of the axes of ellipses is 3:4. Both axes are marked.

1862B. Xylonite Hyperbolas, set of 8, base about $3\frac{3}{8}$ in., height 2 to $5\frac{1}{2}$ in.
(increasing by $\frac{1}{2}$ in.) “

1862C. Xylonite Parabolas, set of 8, base about $3\frac{3}{8}$ in., height $1\frac{1}{4}$ to $5\frac{5}{8}$ in.
(increasing by $\frac{1}{8}$ in.) “

CURVES FOR MECHANICAL ENGINEERS, IN SETS.

Xylonite (transparent)



No. N1863.

Illustration about $\frac{1}{2}$ size.

N1863. Set of 10 Xylonite Curves (transparent), for **Mechanical Engineers**, containing: Nos. 55, 60, 94, 102, 104, 109, 114, 119, 121, 128 of No. 1864, (page 234); in plain box, set

KEUFFEL & ESSER CO., NEW YORK

COPENHAGEN SHIP CURVES

No. 1864. Xylonite (transparent) Ship Curves.

Pattern
No.

31 each
33 "
34 "
35 "
36 "
37 "
38 "
39 "
40 "
41 "
42 "
43 "
44 "
45 "
46 "
47 "
48 "
49 "
50 "

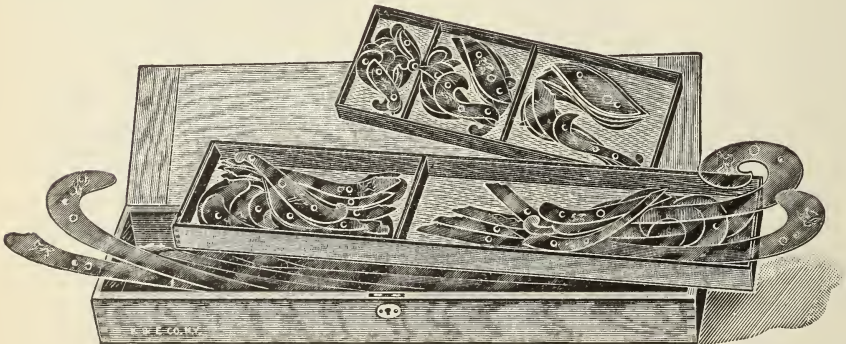
Pattern
No.

53 each
54 "
55 "
56 "
57 "
58 "
59 "
60 "
62 "
64 "
68 "
71 "
80 "
83 "
84 "
86 "
89 "
91 "
92 "

Pattern
No.

94 each
95 "
97 "
100 "
101 "
102 "
103 "
104 "
107 "
108 "
109 "
114 "
119 "
120 "
121 "
128 "
136 "
150 "

In ordering, please state catalogue and pattern number.



N 1865 S. Set of 56 Xylonite (transparent) Copenhagen Ship Curves, Nos. 31 to 150, as listed above under No. 1864; in hardwood Case, set

KEUFFEL & ESSER CO., NEW YORK

No. 1864. **SHIP CURVES** (Copenhagen). Xylonite (transparent).

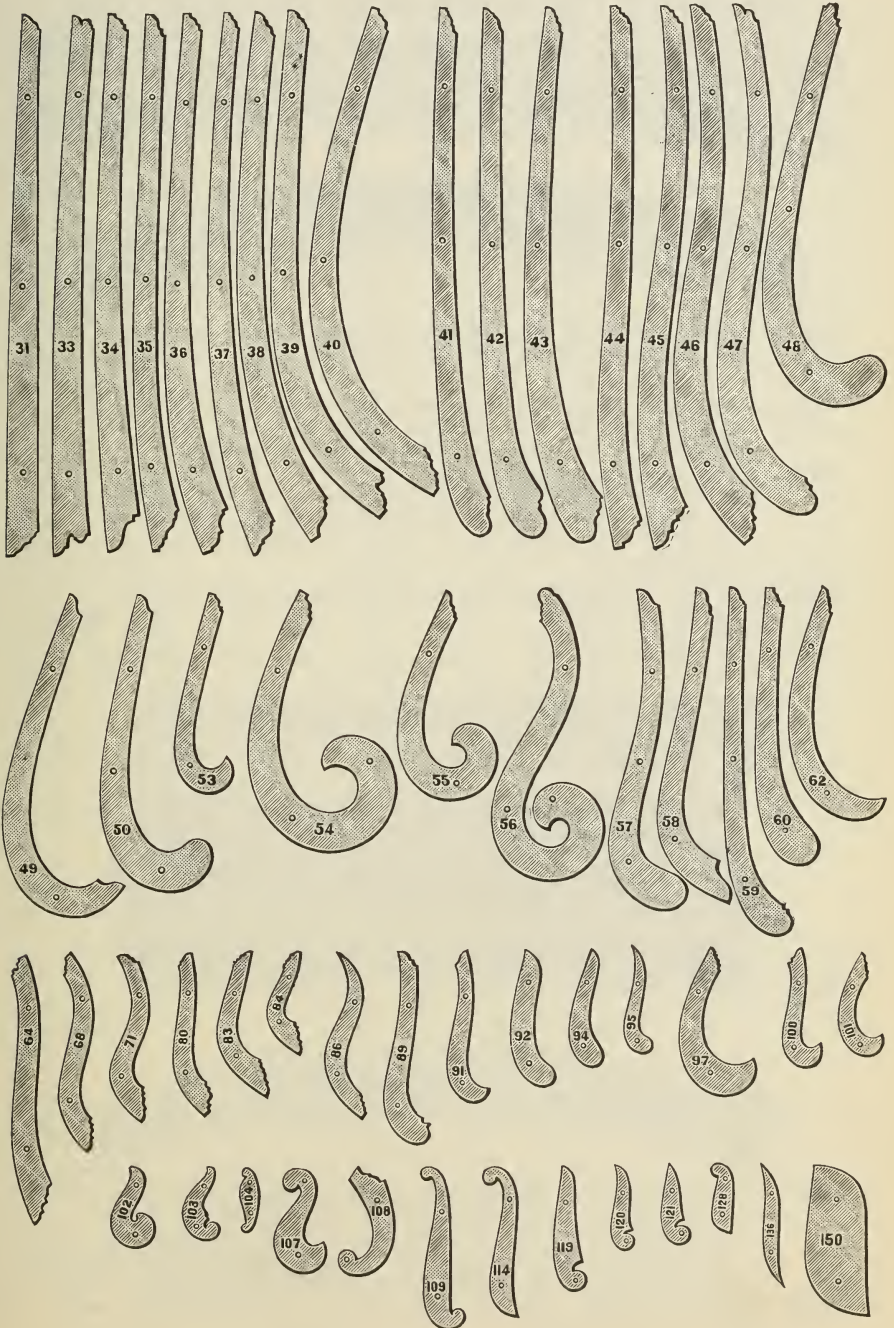
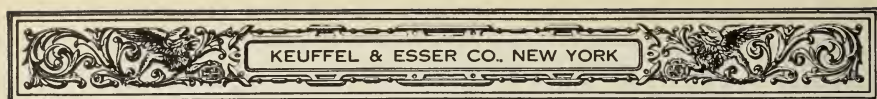


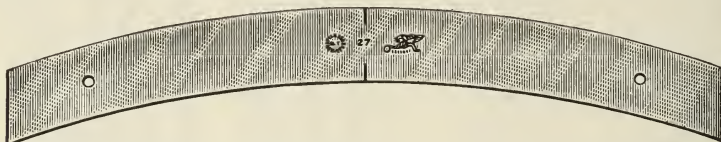
Illustration about $\frac{1}{6}$ size



XYLONITE RAILROAD CURVES.

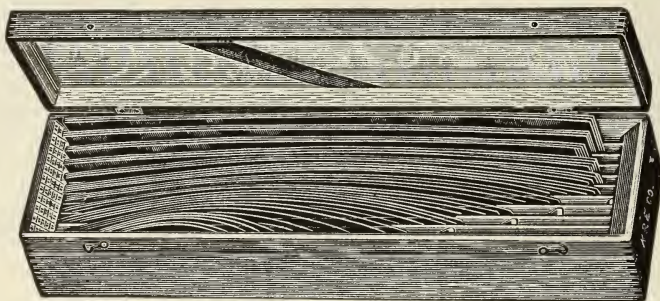
These curves are cut by special machinery and are true circular curves. They are the same on both edges, so that either edge can be used. K&E curves will be found far more accurate than any others. Their edges have the same hand finish as other K & E xylonite tools.

They are put up in wooden boxes, with partitions (except No. 1891) to prevent warping of the curves from mutual pressure while in the box. Each compartment is plainly stamped with the value of the curves contained in it, so that the required curve is easily picked out.

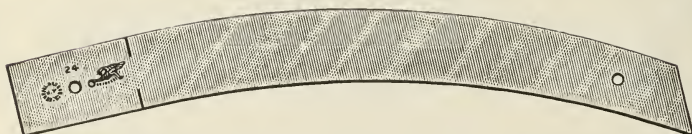


- 1891.** Xylonite (transparent) Railroad Curves, 17 in set, viz: 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60 in. radius; in wooden box set
- 1891A.** Xylonite (transparent) Railroad Curves, 30 in set, viz: $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$, 5, $5\frac{1}{2}$, 6, 7, 8, 9, 10, 11, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 35, 40, 45, 50, 60 in. radius; in wooden box with partitions "
- 1891B.** Xylonite (transparent) Railroad Curves, 50 in set, viz: $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$, 5, $5\frac{1}{2}$, 6, $6\frac{1}{2}$, 7, $7\frac{1}{2}$, 8, $8\frac{1}{2}$, 9, $9\frac{1}{2}$, 10, $10\frac{1}{2}$, 11, $11\frac{1}{2}$, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 110, 120 in. radius; in wooden box with partitions "
- 1894A.** Separate (transparent) Xylonite Railroad Curves, from sets 1891, 1891A and 1891B each
- No. 1894A is old No. 1891F.

Note: Curves without tangents have a radial line at the middle for ease in plotting.

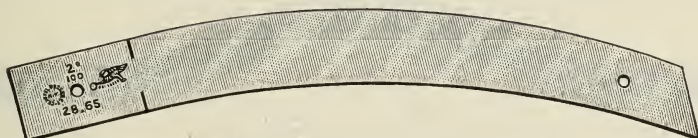


No. 1891 C. (Box with partitions)



- 1891C.** Xylonite (transparent) Railroad Curves, with Tangent, 55 in set, viz: 3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 32, 34, 35, 36, 38, 40, 45, 50, 55, 60, 65, 70, 75, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200 in. radius; in wooden box with partitions . . . set
- 1894C.** Separate (transparent) Xylonite Railroad Curves, from set 1891C . . . each
- No. 1894C is old No. N1891G.

XYLONITE RAILROAD CURVES.



1891 D. Xylonite (transparent) Railroad Curves, with Tangent, marked in degrees and inches, to scale 100 feet = 1 inch, 41 in set, viz.:

0°.30' = 114.59 in.	3°.30' = 16.37 in.	6° = 9.55 in.	8°.30' = 6.75 in.
1° = 57.30 "	3°.45' = 15.28 "	6°.15' = 9.17 "	8°.45' = 6.55 "
1°.15' = 45.84 "	4° = 14.33 "	6°.30' = 8.82 "	9° = 6.37 "
1°.30' = 38.20 "	4°.15' = 13.48 "	6°.45' = 8.49 "	9°.15' = 6.20 "
1°.45' = 32.74 "	4°.30' = 12.73 "	7° = 8.19 "	9°.30' = 6.04 "
2° = 28.65 "	4°.45' = 12.07 "	7°.15' = 7.91 "	9°.45' = 5.88 "
2°.15' = 25.47 "	5° = 11.46 "	7°.30' = 7.64 "	10° = 5.74 "
2°.30' = 22.92 "	5°.15' = 10.92 "	7°.45' = 7.40 "	10°.30' = 5.46 "
2°.45' = 20.84 "	5°.30' = 10.42 "	8° = 7.17 "	11° = 5.22 "
3° = 19.10 "	5°.45' = 9.97 "	8°.15' = 6.95 "	11°.30' = 4.99 "
3°.15' = 17.63 "	in wooden box with partitions. set		

1891 E. Xylonite Railroad Curves, with Tangent, marked in degrees and inches, to scale 100 feet = 1 inch, 55 in set, viz.:

0°.15' = 229.18 in.	3°.45' = 15.28 in.	7°.15' = 7.91 in.	11°.30' = 4.99 in.
0°.30' = 114.59 "	4° = 14.33 "	7°.30' = 7.64 "	12° = 4.78 "
0°.45' = 76.39 "	4°.15' = 13.48 "	7°.45' = 7.40 "	12°.30' = 4.59 "
1° = 57.30 "	4°.30' = 12.73 "	8° = 7.17 "	13° = 4.42 "
1°.15' = 45.84 "	4°.45' = 12.07 "	8°.15' = 6.95 "	13°.30' = 4.25 "
1°.30' = 38.20 "	5° = 11.46 "	8°.30' = 6.75 "	14° = 4.10 "
1°.45' = 32.74 "	5°.15' = 10.92 "	8°.45' = 6.55 "	14°.30' = 3.96 "
2° = 28.65 "	5°.30' = 10.42 "	9° = 6.37 "	15° = 3.83 "
2°.15' = 25.47 "	5°.45' = 9.97 "	9°.15' = 6.20 "	16° = 3.59 "
2°.30' = 22.92 "	6° = 9.55 "	9°.30' = 6.04 "	17° = 3.38 "
2°.45' = 20.84 "	6°.15' = 9.17 "	9°.45' = 5.88 "	18° = 3.20 "
3° = 19.10 "	6°.30' = 8.82 "	10° = 5.74 "	19° = 3.03 "
3°.15' = 17.63 "	6°.45' = 8.49 "	10°.30' = 5.46 "	20° = 2.88 "
3°.30' = 16.37 "	7° = 8.19 "	11° = 5.22 "	

in wooden box with partitions. (see cut, page 236) . . set

1894D. Separate (transparent) Xylonite Railroad Curves, from sets 1891D and 1891E each

No. 1894D is old No. N1891H.

The above Xylonite Railroad Curves are made to correct radii, to a scale of 1 inch=100 feet, both edges having the same radius. Formula: radius = $\frac{1}{2}$ chord + sin. $\frac{1}{2}$ angle = 50 ÷ sin. $\frac{1}{2}$ angle. The short tangents are very useful, as they enable the beginning of the curve to be correctly located on the drawing by means of the radial line separating the tangent from the curve. These curves can also be used for the formula $\frac{1}{2}$ arc + sin $\frac{1}{2}$ angle, the difference being negligible.

SPECIAL RAILROAD CURVES.

Railroad Curves, as described above,

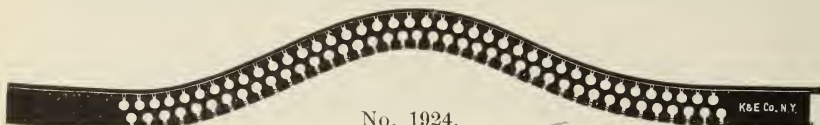
1895. Special (transparent) Xylonite Railroad Curves, without tangent,
made to order to any desired radius in inches each
No. 1895 is old No. 1891½F.

1895T. Special (transparent) Xylonite Railroad Curves, with tangent,
made to order to any desired radius in inches "
No. 1895T is old No. 1891½G.

1895S. Special (transparent) Xylonite Railroad Curves, with tangent,
marked in degrees and inches, made to order to any
desired scale "
No. 1895S is old No. 1891½H.

KEUFFEL & ESSER CO. NEW YORK

FLEXIBLE CURVE RULE.



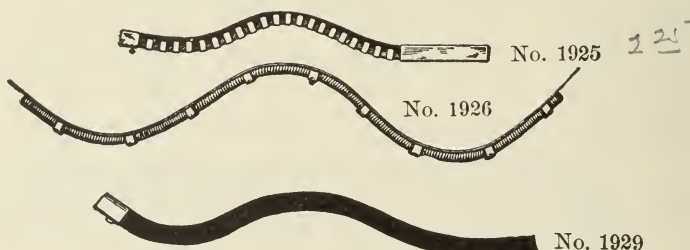
1924-12	Flexible Curve Rule, 12 in. long	2.75	each	2.75
1924-18	" " " 18 " "		"	3.75
1924-24	" " " 24 " "		"	5.50
1924-30	" " " 30 " "		"	6.50

No. 1924 is old No. N2174.

This flexible curve rule embodies all the advantages, without any of the drawbacks of the ordinary curve rules, which for certain classes of work are often too thick and clumsy. It will also be found preferable to splines, since the latter require heavy weights to keep them in place.

The principle underlying the construction of this rule represents a departure for curve rules. Parallel to the length of the rule, which is of black xylonite, are two rows of circular holes. A slit extends from each hole to the nearer edge, thus making the rule very flexible. On one edge is a ruling strip of black xylonite, and on the other a soft wire for retaining the rule in any curve into which it may be bent. Each extremity ends in a tangent.

ADJUSTABLE CURVES.



1925.	Adjustable Curve Rule, 14½ in. long		each	2.25
1926.	do. do. 30 " "		"	3.75
1929.	do. do. Plain	7 15 31 in.		
	each	45 98 182		

Nos. 1925-1929 are old Nos. 2175-2179.

These curve rules consist of a ruling edge of rubber (except No. 1926, which has steel ruling edge) in combination with a bar of soft lead. They will hold any curve into which they are bent.

SPLINES AND SPLINE WEIGHTS.



No. 1934 with 1936 or 1936-1.

1934.	Xylonite (transparent) Splines, grooved,				
	24	30	36	42	48 in.
	each				

No. 1934 is old No. N2184.

1936. Lead Weights for Splines, with finger, about 3¼ pounds each

No. 1936 is old No. 2186.

1936-1. Lead Weights " " " " " 8 " "

No. 1936-1 is old No. 2186-1.



K & E

REG. U. S. PAT. OFF.

STRAIGHTEDGES. STAINLESS STEEL.



No. S2020



No. S2030.

S2020. Stainless Steel Straightedges, with square edges,

15	18	24	30	36	42	48	54	60	72 in.	long
$1\frac{3}{8}$	$1\frac{3}{8}$	$1\frac{3}{8}$	2	2	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	3	3 "	wide
.07	.07	.07	.09	.09	.09	.09	.09	.09	.09 "	thick

each

S2030. Stainless Steel Straightedges, one edge beveled,

15	18	24	30	36	42	48	54	60	72 in.	long
$1\frac{3}{8}$	$1\frac{3}{8}$	$1\frac{3}{8}$	2	2	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	3	3 "	wide
.07	.07	.07	.09	.09	.09	.09	.09	.09	.09 "	thick

each

WOOD.

K & E Wooden Straightedges are made of the very best materials that can be obtained. These materials are carefully selected and seasoned in our own factory, according to the latest improved practices, under the most rigid supervision, so that they will stand up under severe atmospheric conditions.



No. 2036.

2036. Xylonite Lined Straightedges Maple, square edges,

18	24	30	36	42	48	54	60 in.
----	----	----	----	----	----	----	--------

each

No. 2036 is old No. 1886.



No. 2038.

2038. Hardwood Straightedges, square edges,

24	30	36	42	48	60	72	*84	*96	*120 in.
----	----	----	----	----	----	----	-----	-----	----------

each

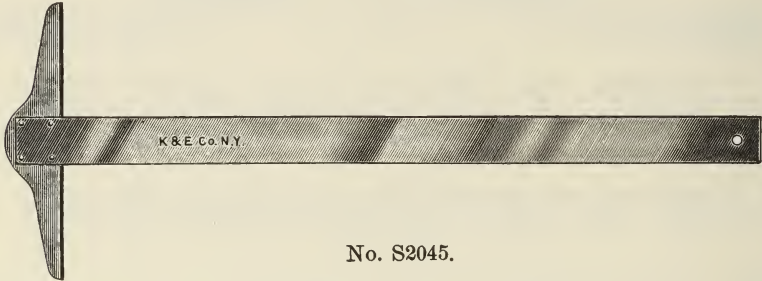
No. 2038 is old No. 2260.

***Made to order only.**



K & E
REG. U. S. PAT. OFF.

METAL T-SQUARES.

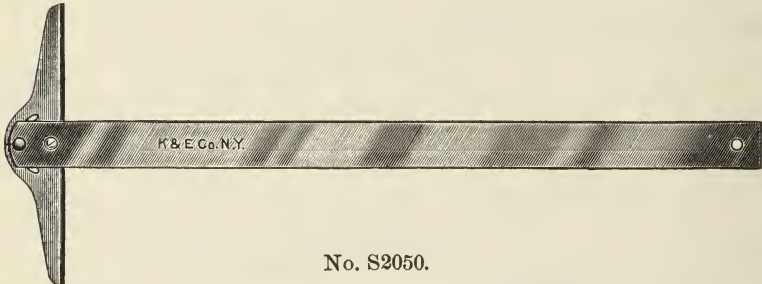


No. S2045.

S2045. T Squares, Stainless Steel Blade, fixed nickel silver Head,

24	30	36	42 in.	long
2	2	2	2 "	wide
.09	.09	.09	.09 "	thick

each



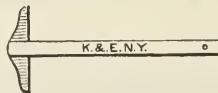
No. S2050.

S2050. T Squares, Stainless Steel Blade, shifting nickel silver Head, with nickelplated swivel,

24	30	36	42 in.	long
2	2	2	2 "	wide
.09	.09	.09	.09 "	thick

each

ENGRAVER'S T SQUARES.



No. 2060.

2060. Engraver's T Square, Steel Blade, fixed Brass Head, 12 in., . each



No. 2065.

2065. Engraver's T Square, Steel Blade, shifting Brass Head, with swivel, 12 in. each

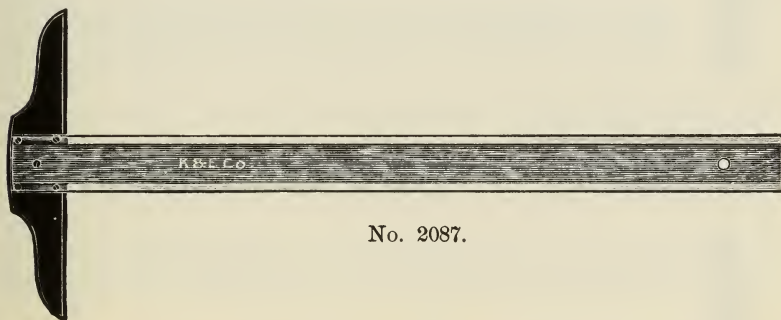


K & E
REG. U. S. PAT. OFF.

WOODEN T-SQUARES.

K & E T Squares are made of the very best materials that can be obtained. These materials are carefully selected and seasoned in our factory, according to the latest improved practices, under the most rigid supervision, so that they will stand up under severe atmospheric conditions.

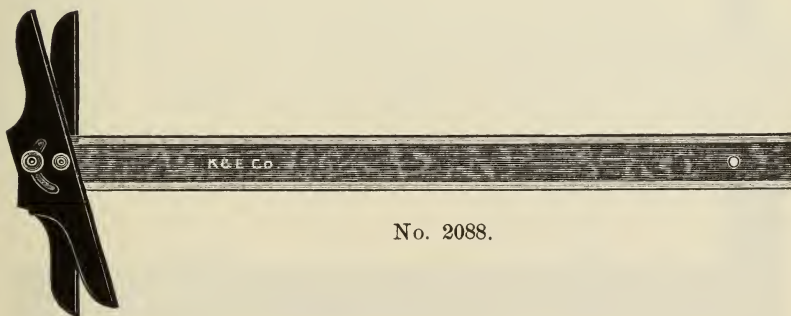
TRANSPARENT XYLONITE LINING.



No. 2087.

2087. Maple Blade, Xylonite (transparent) Lining, fixed head, Ebony finish,
15 18 24 30 36 42 48 54 60 72 in.
each

No. 2087 is old No. 1887.



No. 2088.

2088. Maple Blade, Xylonite (transparent) Lining, swiveling head, Ebony finish,
K & E Co. pattern, with 2 fine brass clamps. The 15 and 18 in.
squares have one clamp.

15 18 24 30 36 42 48 54 60 72 in.
each

No. 2088 is old No. 1888.

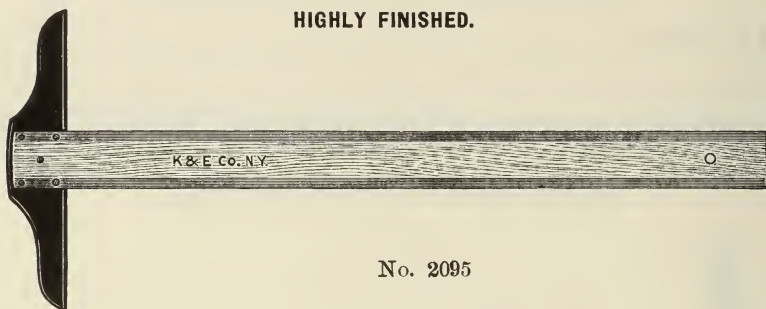


K & E

REG. U. S. PAT. OFF.

WOODEN T-SQUARES.

HIGHLY FINISHED.



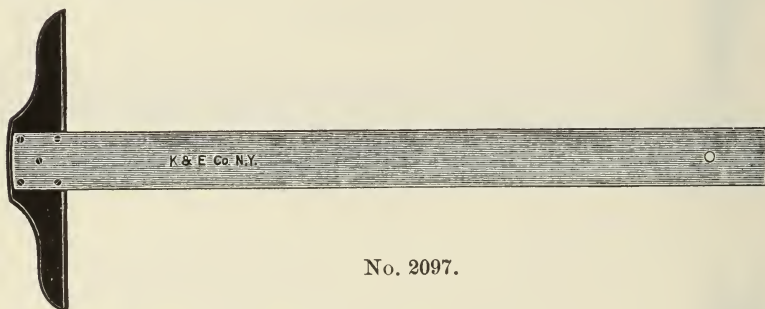
No. 2095

2095. Hardwood lined Blade, fixed Head, Ebony finish,

24 30 36 42 48 in.

each

No. 2095 is old No. 2360.



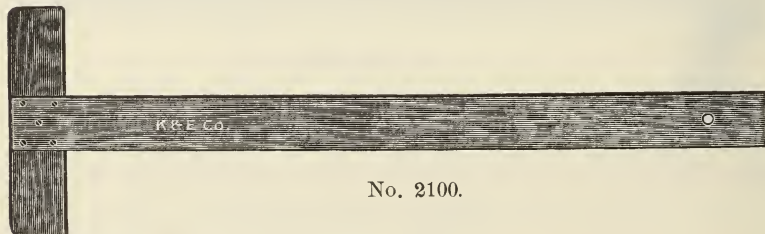
No. 2097.

2097. Maple Blade, fixed Head, Ebony Finish,

24 30 36 in.

each

No. 2097 is old No. 2330.



No. 2100.

2100. Pearwood Blade, and fixed Head,

15 18 21 24 30 36 42 48 in.

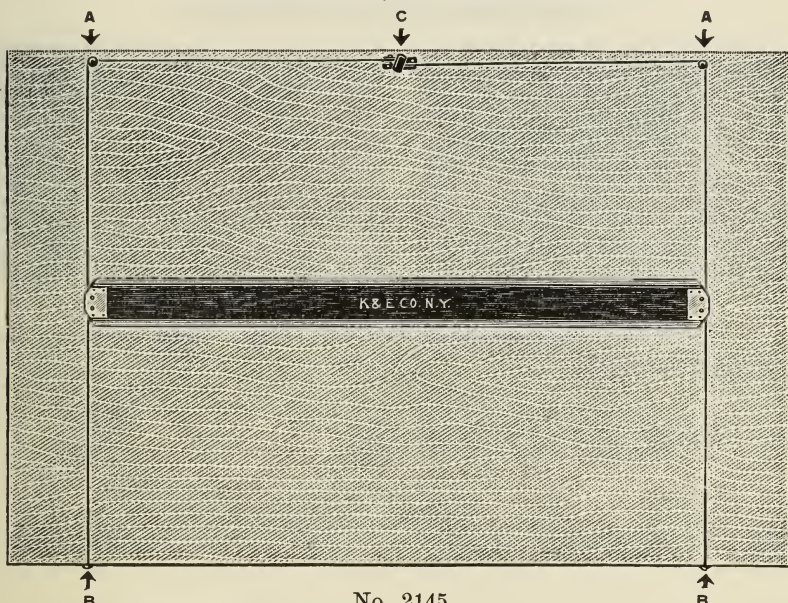
each

No. 2100 is old No. 2300.

KEUFFEL & ESSER CO., NEW YORK

JACOB'S PARALLEL STRAIGHTEDGE.

FOR DRAWING BOARDS AND TABLES.



No. 2145.

Jacob's Parallel Straightedge is rapidly and efficiently secured to the drawing board by means of four special tacks or screw posts and one thumbtack with a rubber head. Except for these five tacks A, A, B, B and C (see illustration), the straightedge is self contained, the necessary pulleys being entirely housed between the end plates. The cord passes from one end of the straightedge to the other through a conduit formed within the blade.

The straightedge is compact, light in weight, handsome in appearance, and has no parts which are likely to get out of order.

Jacob's Parallel Straightedge presents the following advantages:

1. It can be secured to any drawing board longer than the straightedge. 2. It may be quickly transferred from one drawing board to another, and thus made to serve an entire drafting room. 3. Since it does not project beyond the ends of the drawing board it cannot be accidentally struck by any one passing the board. 4. It can be set up to operate on any particular part of a large drawing board, leaving the remainder clear for other work. 5. Since the pulleys are completely enclosed they cannot interfere with the work of the draftsman. 6. The construction is such that the cord cannot accidentally slip off the pulleys.

Jacob's Parallel Straightedge, mahogany face, xylonite (transparent) lined, both edges beveled, all metal parts of nickel silver.

Without ledge for pencils

2145.—36 in.	each
42 in.	
48 in.	
54 in.	
60 in.	
72 in.	
84 in.	
96 in.	

With ledge for pencils

2145T. 36 in.	each
42 in.	
48 in.	
54 in.	
60 in.	
72 in.*	
84 in.*	
96 in.*	

The lengths given, are from cord to cord.

No. 2145 is old No. 2545.

2145K. Adjusting Device, for Jacob's Parallel Straightedge, which, by a simple movement, tightens the cord, each

No. 2145K is old No. 2545K.

2146. Tinsel Cord for Jacob's Parallel Straightedge, on wooden spool per 100 ft.

No. 2146 is old No. 2546.

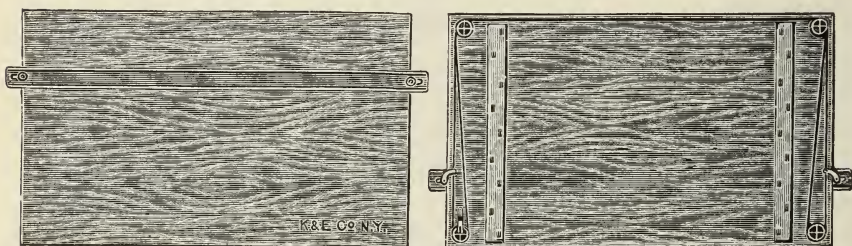
* To order only.



K & E PARALLEL ATTACHMENT

REG. U. S. PAT. OFF.

FOR DRAWING BOARDS AND TABLES.



The K & E Parallel Attachment insures absolutely parallel motion of the straightedge whether set horizontal or at an angle. The setting is quickly effected by releasing and tightening the clamps which hold the straightedge to the board. In the same way the straightedge can be readily removed when a T square is to be used on the board. The attachment can be applied, without other directions than the above cut conveys, to any board having ledges or available space underneath.

The fixtures consist of 2 double and 2 single pulleys, 2 clamps, and the cord.

- 2147 A.** Fixtures for K & E Parallel Attachment (except straight-edge) for boards $\frac{3}{4}$ in. thick . . . set
- 2147 B.** " " " " 1 " " " "
- 2147 C.** " " " " $1\frac{1}{4}$ " " " "
- 2147 D.** " " " " $1\frac{3}{8}$ " " " "
- 2147 H.** " " " " for all Fulton and Hudson Drawing Tables "

No. 2147 is old No. 2547.

When ordering, please state thickness and size of the drawing board.



No. 2149 T.

- 2149.** Maple Straightedge, xylonite (transparent) lined, for K & E Parallel Attachment,
- | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|--------|
| for boards | 26 | 31 | 42 | 48 | 55 | 60 | 72 | 84 | 96 in. |
| each | | | | | | | | | |

No. 2149 is old No. 2549.

- 2149T.** Maple Straightedge, xylonite (transparent) lined for K & E Parallel Attachments, with ledge for pencils and small tools,
- | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|--------|
| for boards | 26 | 31 | 42 | 48 | 55 | 60 | 72 | 84 | 96 in. |
| each | | | | | | | | | |

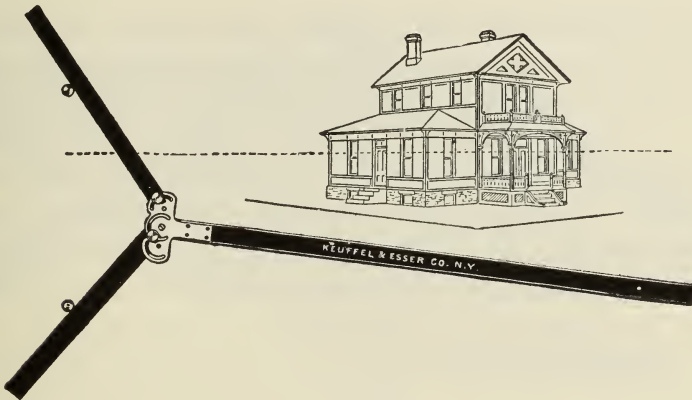
No. 2149T is old No. 2549T.

Note: Straightedges over 42 in. long have beveled edge.

- 2146.** Tinsel Cord for K & E Parallel Attachment, on wooden spool per 100 feet
- No. 2146 is old No. 2546.

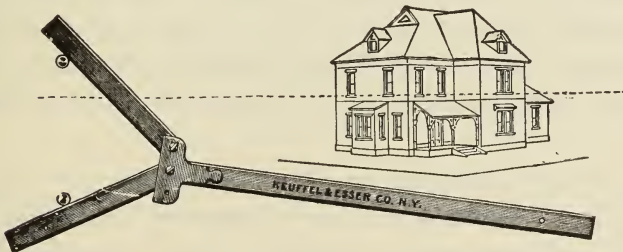


CENTROLINEADS FOR PERSPECTIVE DRAWING.



No. 2250

- 2250.** Centrolinead, hardwood, Ebony finish, brass mountings, Blade 42 in., both edges beveled, Arms 15 in., with two Studs . each
No. 2250 is old No. N2450.



No. 2251

- 2251.** Centrolinead, hardwood, brass swivels, with two Studs,
Blade 24 in., Arms 10 in. each
No. 2251 is old No. 2451.

Centrolineads are used when the vanishing point of a perspective drawing is beyond the drawing board. To use the instrument from the right-hand side, one of the blades can be shifted to the socket in the other end of the cross head.

Directions furnished with Centrolineads.



K & E
REG. U. S. PAT. OFF.

DRAFTING ROOM FURNITURE.

The following section lists all Drafting Room Furniture in one group, thus facilitating the selection of this very important part of the office equipment of the Engineer, Architect and Draftsman.

The K & E assortment of modern Drafting Room Furniture covers a selected line of **Blueprint Frames, Drawing Boards, Drawing Tables and Chests of Drawers.** Each unit is the best of its kind, and of a design which has been developed through years of experience. Every necessary feature which makes for convenience and ease in drafting work has been embodied in the design of each unit. By combining all necessary and convenient features in carefully designed units, we have relieved the draftsman of making his choice from a great number of styles which frequently exhibit only unimportant differences.

All of these goods are of K & E Co. manufacture. They are constructed by experienced and highly skilled artisans. The lumber of which they are made is not only the very best that can be obtained, but is re-selected and consequently of far higher quality than any commercial grade. It is also thoroughly seasoned and conditioned by the most modern scientific processes. Thus K & E Drafting Room Furniture is the best attainable in material, workmanship, durability and ability to hold its shape; will last a lifetime; and gives enduring satisfaction.

It is impossible to **show quality and finish** of goods like these by illustration and description; and the buyer who does not want to be disappointed must rely on the reputation and standing of the manufacturer. Every piece of our Drafting Room Furniture is guaranteed to be exactly as represented.

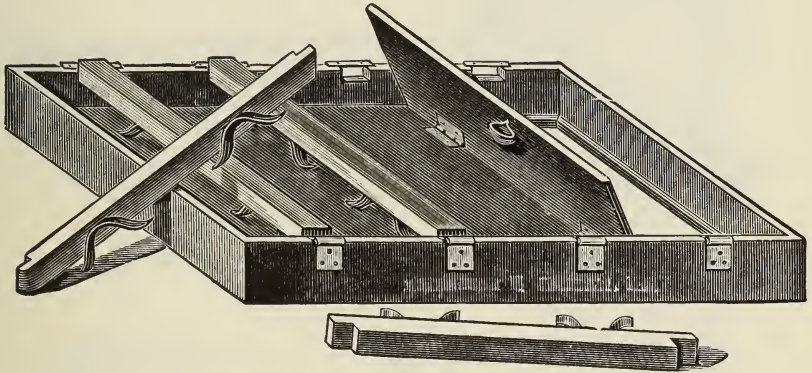
Since we are convinced of the superior quality of K & E Drafting Room Furniture, any article which does not prove satisfactory to the buyer upon receipt will be taken back immediately.



K & E

REG. U. S. PAT. OFF.

PRINT FRAMES.



No. 2456 H.

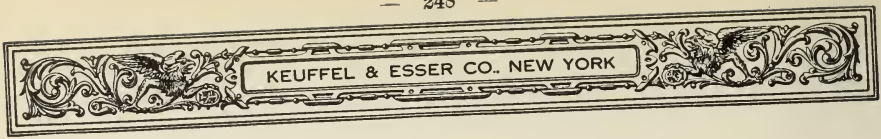
These print frames are made of carefully selected oak, thoroughly seasoned, finely finished, and well protected against atmospheric changes. They will not shrink and become loose at the joints, nor will they swell and crack the glass. The clamping bars are of hard maple. The back is made of a wood which couples strength with lightness in weight; and which, because of the absence of a tendency to warp, lies flat at all points; thus insuring adequate pressure upon all parts of the pad. The hinges and springs are brass.

Ship'g
weight
frames
about

		Printing Surface		Frame only.
35 lb	2456 E.	20×24 in.		each
40 lb	2456 G.	24×30 "		"
70 lb	2456 H.	30×42 "		"

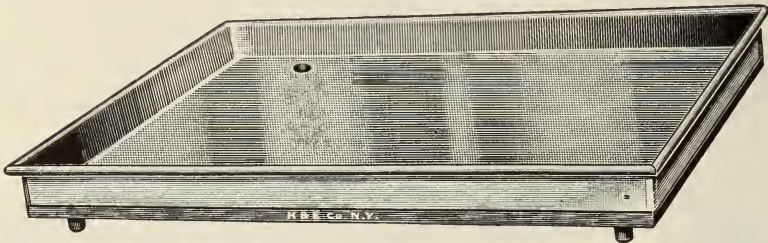
It is recommended that the glass and pad be obtained locally.

Prices cover crating for shipment.



BATH TRAYS.

SUPERIOR QUALITY ZINC BATH TRAYS.



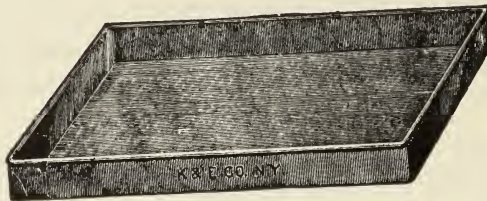
No. 2465H.

WITH DRAIN PIPE, STRONG RIM AND HARDWOOD BRACES.

2465 E.	Superior Quality Bath Tray,	20×24 in.	. . . . .	each
2465 G.	" " " "	24×30 "	. . . . .	"
2465 H.	" " " "	30×42 "	. . . . .	"

No. 2465 is old No. 2480.

PLAIN ZINC BATH TRAYS.



No. 2466E.

PLAIN, WITH STRONG RIM.

2466 E.	Plain Bath Tray,	20×24 in.	. . . . .	each
2466 G.	" " " "	24×30 "	. . . . .	"

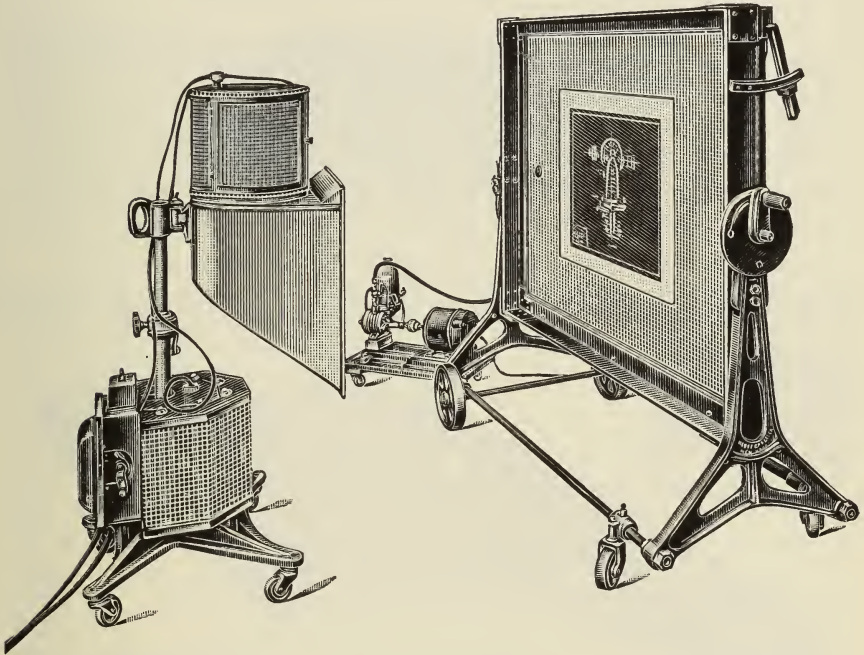
No. 2466 is old No. 2484.

The prices of bath trays cover crating for shipment.

KEUFFEL & ESSER CO., NEW YORK

K & E
REG. U. S. PAT. OFF.

VACUUM PRINT FRAME.



No. 2474 (Lamp)

No. 2476 (Pump)

No. 2470S (Frame)

The K & E Vacuum Print Frame insures perfect contact in both sun and electric printing. It is especially suitable for making Maduro negatives, and Dupro reproductions on tracing cloth (see page 42). It saves time, since there are no cross-bars and backing to be lifted out; perfect contact being insured by the exhaustion of the air between the sensitized photo-print sheet and the negative or tracing through the use of a special rubber backing pad, a hose and a vacuum pump. The clamps which hold the pad may be instantly locked, or released. The frame can be efficiently locked in any position, and rotated with little effort.

2470S. K & E Vacuum Print Frame, 56×86 in. printing surface, with specially made rubber pad and hose, but without plate glass, on iron frame standeach

2474A. Lamp for Vacuum Printing Process, for AC voltage, mounted on castor base..... “

2474D. Lamp for Vacuum Printing Process, for DC voltage, mounted on castor base..... “

For electric printing, frame No. 2470 S requires two lamps.

2476. Pump with Motor for Vacuum Print Frame, $\frac{1}{2}$ H.P., 110 or 220 volt, D.C., or A.C. The type of voltage—AC or DC—must be specified in the order “

Special size frames made to order.



K & E
REG. U. S. PAT. OFF.

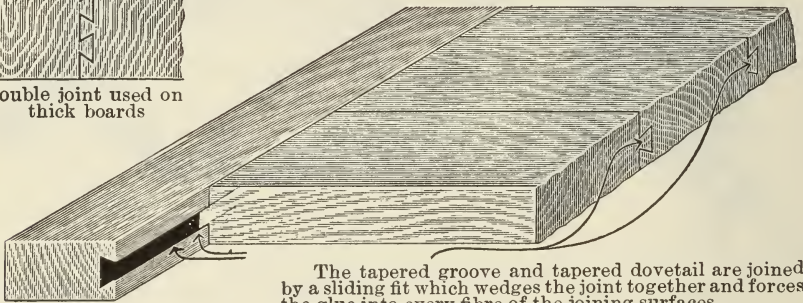
DRAWING BOARDS.

K & E Drawing Boards are made of thoroughly seasoned, selected, soft white pine of uniform grain. Boards can be made for much less money if other woods than white pine are employed, or if a lower grade of white pine is used. They can also be made at a much cheaper figure if the material is less carefully seasoned, selected, and matched; and if less attention is paid to workmanship and finish. The workmanship and finish of K & E Drawing Boards are unexcelled. They are built up of narrow strips which are jointed by means of

THE TAPERED WEDGE DOVETAIL GLUE JOINT



Double joint used on thick boards

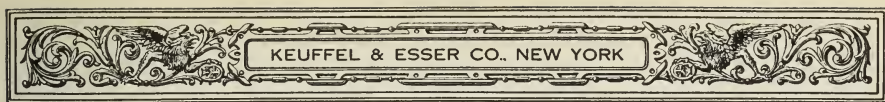


The tapered groove and tapered dovetail are joined by a sliding fit which wedges the joint together and forces the glue into every fibre of the joining surfaces.

The manufacturer of drawing boards is forced to realize the fact that an article made of wood is only as strong as its joints. We have secured a joint that is 100 per cent efficient by adapting the self-clamping **Tapered Wedge Dovetail Glue Joint** to our drawing boards. This joint does not require the use of clamps or wedges when first glued; since both the dovetail tongue and the groove are tapered from one end to the other, and, being joined by a sliding fit, clamp themselves together in the most perfect manner. This method of joining forces the glue into every fibre of the joined surfaces, and results in perfect holding power.

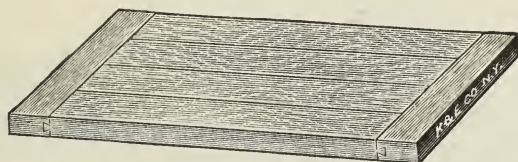
K & E Co. have spent considerable time, and have incurred great expense in developing the best methods of applying the Tapered Wedge Dovetail Glue Joint to these drawing boards. The result is a joint which use has proved to be unequalled for the purpose; and one which is fully guaranteed.

The Tapered Wedge Dovetail Glue Joint cannot fail or open, and is invariably stronger than the wood itself.



K & E
REG. U. S. PAT. OFF.

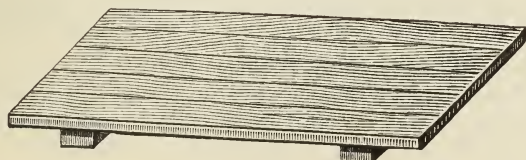
DRAWING BOARDS.



No. 2505.

K & E Drawing Boards Nos. 2505-2510 have two drawing surfaces. They are of thoroughly seasoned, selected, soft white pine throughout, including the end ledges. The narrow board strips and the end ledges are joined by means of the Tapered Wedge Dovetail Glue Joint (see page 250). Nos. 2505-2510 are the best boards of this type that can be made.

		Thickness Finished Size		Dimensions	
2505.	Drawing Board,	$\frac{3}{4}$ in.	. . . . .	12×17 in.	each
2506.	"	"	. . . . .	16×21 "	"
2506 $\frac{1}{2}$.	"	"	. . . . .	18×24 "	"
2507.	"	"	. . . . .	20×26 "	"
2508.	"	"	. . . . .	23×31 "	"
2510.	"	"	. . . . .	31×42 "	"



No. 2522.

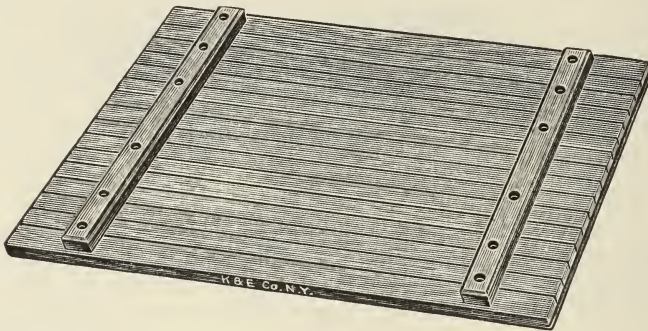
K & E Drawing Boards Nos. 2522 and 2523 are of the same quality as Boards Nos. 2505-2510. The boards are made of thoroughly seasoned, selected, soft white pine, with two hardwood ledges underneath. These ledges are secured to the board by screws passing through metal washers which are slotted to allow for the expansion and contraction of the wood. This method of fastening the ledges to the board is the best, and insures that the board will not buckle or warp.

		Thickness Finished Size		Dimensions	
2522.	Drawing Board,	$\frac{3}{4}$ in.	23×31 in.	each
2523.	"	"	31×42 "	"



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DRAWING BOARDS.



No. 2532.

K & E Drawing Boards Nos. 2532 to 2535 are the finest drawing boards made. They are constructed of quartered, soft white pine, selected with special care, matched, joined, and glued by means of the Tapered Wedge Dovetail Glue Joint (see page 250). Two hardwood ledges are screwed to the back, the screws passing through the ledges in slots with metal bushings, which fit closely under the heads and yet allow the screws to move freely when drawn by the contraction or expansion of the board. Grooves are cut in the under side of the board, which reduce its transverse strength sufficiently to allow of its control by the ledges, while leaving its longitudinal strength practically unimpaired.

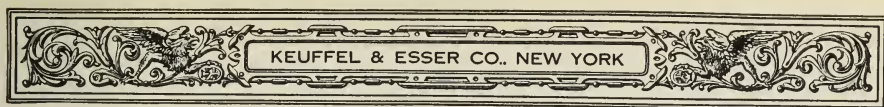
The working edge of the board is rendered perfectly smooth and true for the accurate and easy manipulation of the T-square by the presence of a strip of black xylonite set into it. This strip is cut through at intervals of two inches to allow for the contraction and expansion of the board.

Drawing Boards Nos. 2532 to 2535 are shellacked and highly polished.

		Thickness Finished Size		Dimensions	
2532.	Drawing Board,	$\frac{3}{4}$ in.	. . . . .	23×31 in.	each
2533.	"	1 in.	. . . . .	31×42 "	"
2535.	"	"	. . . . .	36×60 "	"

For Parallel Attachments for Drawing Boards, see pages 243 and 244

Prices cover crating for shipment.



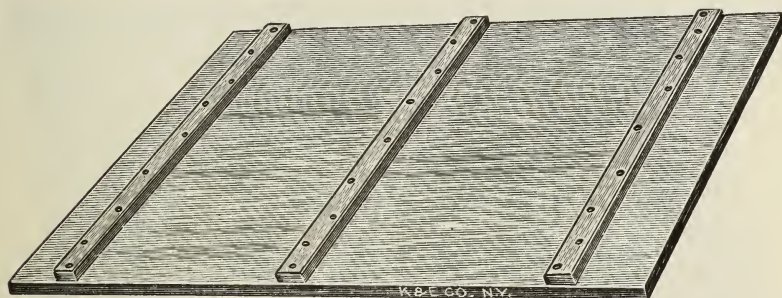
K & E

REG. U. S. PAT. OFF.

AMERICAN EAGLE DRAWING BOARDS.

TRADE MARK

EXTRA LARGE SELECTED BOARDS.



No. 2538 K

K & E American Eagle Drawing Boards Nos. 2538 A to S are made of quartered soft white pine, selected with special care, joined and glued by means of the Tapered Wedge Dovetail Glue Joint (see page 250). Hardwood ledges are screwed to the back of each board; the screws passing through the ledges in slots with metal bushings, which fit closely under the heads and yet allow the screws to move freely when drawn by the expansion or contraction of the board. The boards are completely shellacked.

Ship'g
weight
to a
Crate
about

			Thickness	Dimensions	
75 lb	2538 A	Drawing Board,	$1\frac{1}{8}$ in.	31 × 42 in.	each
80 lb	BS	"	"	36 × 48 "	
100 lb	C	"	"	36 × 60 "	
120 lb	D	"	"	36 × 72 "	
120 lb	DS	"	"	42 × 60 "	
130 lb	E	"	"	42 × 72 "	
140 lb	F	"	"	42 × 84 "	
140 lb	H	"	"	48 × 72 "	
165 lb	I	"	"	48 × 84 "	
175 lb	K	"	"	48 × 96 "	
215 lb	M	"	$1\frac{5}{8}$ in.	48 × 120"	
235 lb	R	"	"	60 × 96 "	
255 lb	S	"	"	60 × 120"	

Prices cover crating for shipment.

For Trestles for Drawing Boards, see page 255.

For Parallel Attachments for Drawing Boards, see pages 243 and 244.

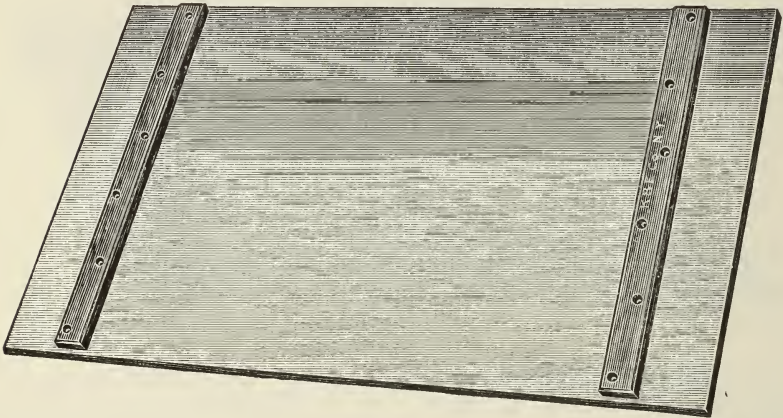


K & E
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FAVORITE DRAWING BOARDS.

TRADE MARK

EXTRA LARGE BOARDS.



No. 2539 E

Favorite Drawing Boards Nos. 2539 BS to K are made of soft white pine, joined and glued by means of the Tapered Wedge Dovetail Glue Joint (see page 250). Hardwood ledges are screwed to the back of each board; the screws passing through the ledges in slots with metal bushings, which fit closely under the heads and yet allow the screws to move freely when drawn by the expansion or contraction of the board. The boards are furnished with a protective coating on both sides, the top being sanded smooth.

Ship'g. weight about			Thickness	Dimensions	
65 lb	2539 BS	Drawing Board,	$1\frac{1}{8}$ in.	36 × 48 in.	each
75 lb	CS	"	"	36 × 54 "	"
85 lb	C	"	"	36 × 60 "	"
110 lb	D	"	"	36 × 72 "	"
115 lb	DS	"	"	42 × 60 "	"
120 lb	E	"	"	42 × 72 "	"
135 lb	F	"	"	42 × 84 "	"
135 lb	H	"	"	48 × 72 "	"
155 lb	I	"	"	48 × 84 "	"
165 lb	K	"	"	48 × 96 "	"

Prices cover crating for shipment.

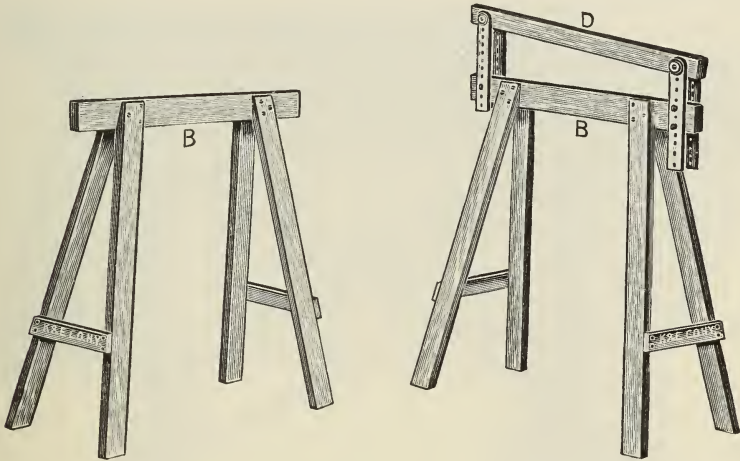
For Trestles for Drawing Boards, see page 255.

For Parallel Attachments for Drawing Boards, see pages 243 and 244.



K & E
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DRAWING BOARD TRESTLES.



No. 2551 B.

No. 2551 B and D.

The horses described below are of simplified construction. Nos. 2551 B and 2551 F are constructed without a slope, but are so designed that the adjustable slopes Nos. 2551 D and 2551 G, which can be raised or lowered and set at a variety of inclinations, may be used with them. No. 2551 K cannot be fitted with a slope.

- 22 lb **2551 B. Wooden Trestles, hardwood, fine quality, 37 in. high, 35 in. long, light natural wood finish pair**

2551B will take No. 2551D.

- 10 lb **2551 D. Adjustable Slope for No. 2551 B, hardwood, fine quality, light natural wood finish, permitting the height of 2551B to be adjusted up to 43½ inches high at various inclinations “**

- 21 lb **2551 F. Wooden Trestles, plain construction, 37 in. high, 35 in. long, natural wood “**

2551F will take No. 2551G.

- 10 lb **2551 G. Adjustable Slope for No. 2551 F, plain construction, natural wood, permitting the height of No. 2551F to be adjusted up to 43½ inches high at various inclinations “**

- 25 lb **2551 K. Wooden Trestles, knock-down type, with legs fitting into steel sockets on head, 37 in. high, 35 in. long, natural wood “**

No. 2551K, when unassembled, occupies a very small space. It is made ready for service by simply inserting the ends of the legs in the steel sockets.

Nos. 2551B, D, F, G or K packed knocked down one pair (2) in a corrugated box.

Prices cover crating for shipment.



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POPULAR DRAWING TABLES.

TRADE MARK



No. 2553.

The Popular Drawing Table is of simple design; very serviceable; easily adjusted for height and slope; rigid; and moderate in price.

The hardwood standards are tongued; slide freely in grooves cut in the hardwood base; and can be raised, lowered, and regulated by means of clamp screws attached to the base. The table can thus be set to any height between 34 and 43 inches.

The top is a soft whitewood drawing board of good quality, $\frac{3}{4}$ inch thick, joined and glued by means of the Tapered Wedge Dovetail joint (see page 250). with two hardwood ledges screwed to the back; the screws passing through the ledges in slots with metal bushings, to allow for the contraction and expansion of the board. It is hinged to the standards, and can be fixed in any position which may be desired, lying between the horizontal and a slant of 60 or 65 degrees to the horizontal.

The hardwood parts have a light natural wood finish.

For convenience in transportation this table is furnished knocked-down.

Ship'g
weight
about

				Thickness	Finished Size.	Dimensions	
70 lb	2553-2.	Popular Drawing Table		$\frac{3}{4}$ in.	. . . .	. 23×31 in.	each
90 lb	3.	" " "	"	"	. . . .	. 31×42 "	"
115 lb	4N.	" " "	"	"	. . . .	. 36×48 "	"
125 lb	5.	" " "	"	"	. . . .	. 36×60 "	"

Prices cover crating for shipment.



K & E
REG. U. S. PAT. OFF.

POPULAR DRAWING TABLES.

TRADE MARK



No. 2554 F.

The Popular Drawing Table is of simple design; very serviceable; easily adjusted for height and slope; exceptionally rigid and moderate in price.

The hardwood standards are tongued; slide freely in grooves cut in the hardwood base; and can be raised, lowered, and regulated by means of clamp screws attached to the base. The table can thus be set to any height between 34 and 43 inches.

The top is a soft white pine drawing board of good quality, $1\frac{1}{8}$ inches thick, joined and glued by means of the Tapered Wedge Dovetail Glue Joint (see page 250) with two hardwood ledges screwed to the back; the screws passing through the ledges in slots with metal bushings, to allow for the contraction and expansion of the board. It is hinged to the standards, and can be fixed in any position which may be desired, lying between the horizontal and a slant of 60 or 65 degrees to the horizontal.

The hardwood parts have a light natural wood finish. The board is furnished with a protective coating on both sides, the top being sanded smooth.

For convenience in transportation this table is furnished knocked-down.

Ship's
weight
about

160 lb	2554-D.	Popular Drawing Table
170 lb	E.	" " "
200 lb	F.	" " "

Thickness Finished Size	Dimensions
$1\frac{1}{8}$ in. . . .	36×72 in. each
"	42×72 " "
"	42×84 " "

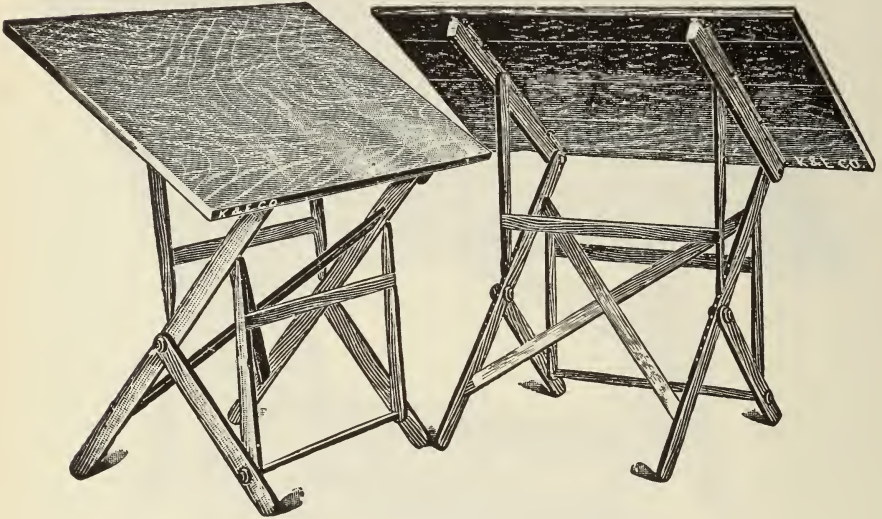
Prices cover crating for shipment.

**K & E**

REG. U. S. PAT. OFF.

UNIQUE FOLDING TRESTLES

TRADE MARK

WITH DRAWING BOARD.

No. N2555.

Unique Folding Trestles, made of Hardwood, combine simplicity of construction with great range of adjustment, firmness in any position, and light weight. The range of adjustment is from 31 to 41 inches for height, and from horizontal to about 45 degrees for slant of board. When folded, these trestles occupy but a few inches in thickness. The trestles have a light natural wood finish. The boards are of soft whitewood, $\frac{3}{4}$ inch thick, with two hardwood ledges screwed to the back; the screws passing through the ledges in slots with metal bushings to allow for the contraction and expansion of the board. The latter is joined and glued by means of the Tapered Wedge Dovetail Glue Joint (See page 250).

Ship'g
weight
about

Unique Folding Trestles, soft whitewood Drawing Board of good quality.

	Thickness, Finished Size	Dimensions
70 lb N2555.	$\frac{3}{4}$ in.	31×42 in. each
110 lb N2557.	"	36×48 " "

Prices cover crating for shipment.

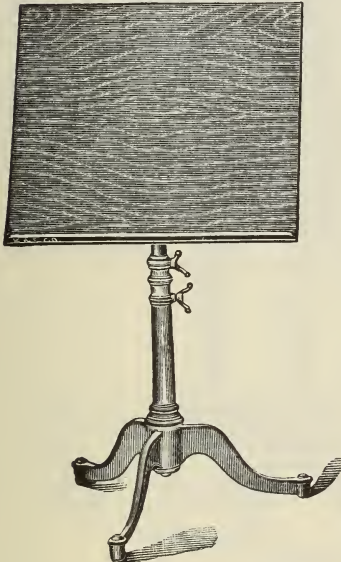
For Parallel Attachments for Drawing Tables, see pages 243 and 244.



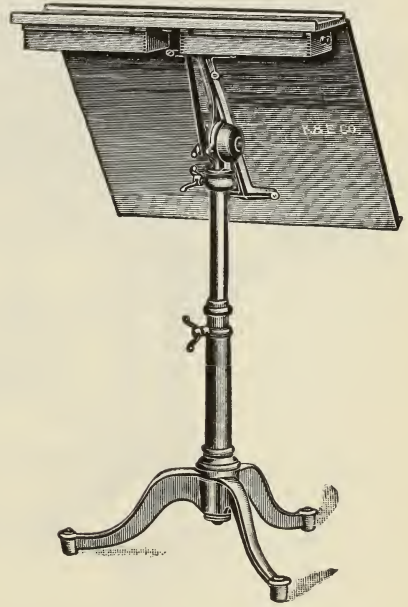
K & E
REG. U. S. PAT. OFF.

COLLEGE DRAWING TABLES.

TRADE MARK



No. 2560.



No. 2561-2

The top is of oak, light finish, and can be clamped horizontal or at any angle by a conveniently placed clamp, which locks it absolutely and rigidly. It is attached to a strong spindle, on which it can be rotated after releasing the clamping screw. There is a sliding collar with a clamp screw on the spindle, by clamping which, the height of the table is regulated. The table stands 30 inches high and can be raised to 42 inches, and the top can be placed at any height within this range or at any inclination. The top shelf or ledge (see cut No. 2561-2) for drawing instruments, inks, etc., remains horizontal at any inclination of the table top.

Ship'g
Weight
about

Width Length

60 lb	2560.	College Drawing Table, 21 × 24 in.,	each
65 lb	2560-1.	College Drawing Table, like 2560, but with addition of top shelf 6½ in. wide × 24 in. long, remaining horizontal at any inclination of the table top	"
65 lb	2561.	College Drawing Table, 22 × 26 in.	"
60 lb	2561-1.	College Drawing Table, like 2561, but with addition of top shelf 6½ in. wide × 26 in. long, remaining horizontal at any inclination of the table top	"
85 lb	2561-2.	College Drawing Table, like 2561, but with addition of top shelf 6½ in. wide × 26 in. long, having two drawers each 4¾ in. long × 12¼ in. deep × 2 in. high inside	"

Casters for any of the above tables set

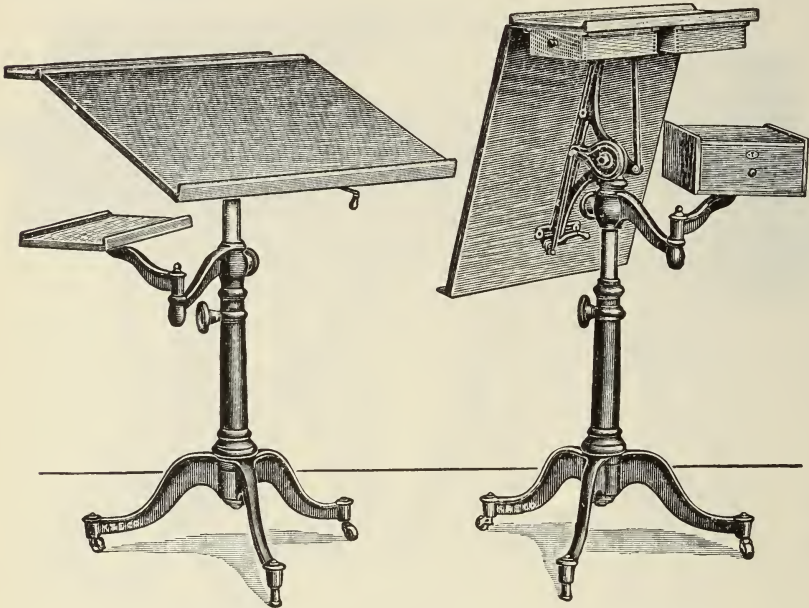
Prices cover crating for shipment.



K & E
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FAVORITE DRAWING TABLES.

TRADE MARK



No. 2571-3.

No. 2571-5.

The adjusting and clamping of the top to any desired slant is done by shifting a lever conveniently placed under the front of the table top, which locks the clamp absolutely.

The Folding Arm with Shelf can be readily moved to any desired point on either side of the table; and raises or lowers with the table top.

The tables are provided with casters on two of the legs; while the third leg has an iron foot to prevent the table from rolling, except when the iron foot is lifted off the floor.

- | | | |
|-------|---|------|
| 75 lb | 2571. Favorite Drawing Table, quartered oak top, polished, 22 in. wide × 26 in. long | each |
| 75 lb | 2571-1. Favorite Drawing Table, like No. 2571, but with addition of top shelf 6½ in. wide × 26 in. long, remaining horizontal at any inclination of the table top | " |
| 90 lb | 2571-2. Favorite Drawing Table, like No. 2571, but with addition of top shelf 6½ in. wide × 26 in. long, having two drawers each 4¾ in. long × 12½ in. deep × 2 in. high inside | " |
| 90 lb | 2571-3. Favorite Drawing Table, like No. 2571, but with addition of top shelf 6½ in. wide × 26 in. long, and folding arm with shelf 16½ in. long × 9½ in. wide | " |
| 90 lb | 2571-4. Favorite Drawing Table, like No. 2571, but with addition of top shelf 6½ in. wide × 26 in. long, having two drawers each 4¾ in. long × 12½ in. deep × 2 in. high inside, and folding arm with shelf 16½ in. long × 9½ in. wide | " |
| 90 lb | 2571-5. Favorite Drawing Table, like No. 2571, but with addition of top shelf 6½ × 26 in. having two drawers each 4¾ × 12½ × 2 in. high inside and folding arm with shelf, 16½ × 9½ in., having one drawer 7½ in. long × 14½ in. deep × 3½ in. high inside | " |

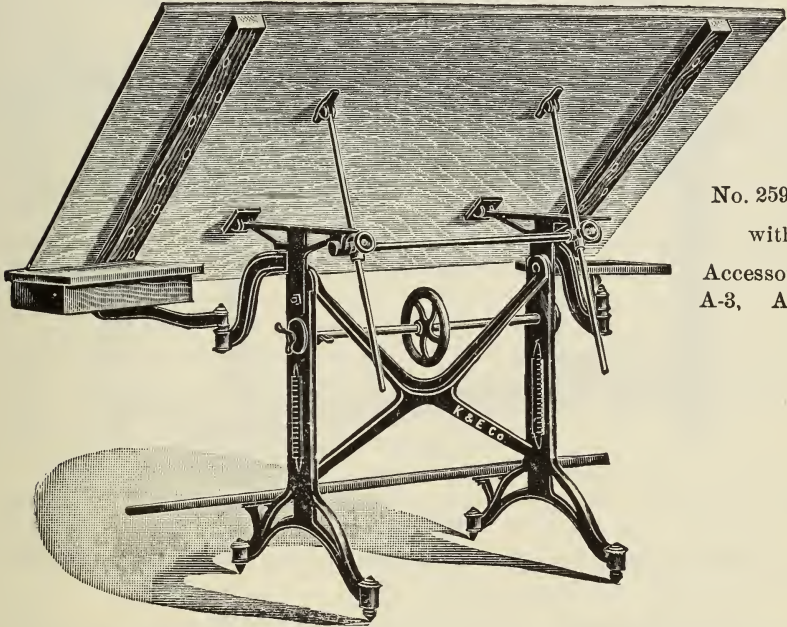
Price covers crating for shipment.



K & E
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AMERICAN EAGLE DRAWING TABLES.

TRADE MARK



No. 2590 E

with

Accessories
A-3, AO-3

The **K & E American Eagle** is a very practical drawing table; rigid, substantial, capable of free adjustment, and durable. It is 36 in. high and can be raised to 48 in. by a rack and pinion in each of the two iron standards, operated by one large hand wheel. The top is a white pine drawing board of fine quality, (see page 253) shellacked all over, and hinged to the standards. It can be set at any slant from the horizontal to nearly vertical. It is held rigid by iron rods with clamp screws. The footboard is of hardwood.

Ship's
weight
about

					Thickness	Dimensions	
220 lb	2590 A.	American Eagle Drawing Table,	board	$1\frac{1}{16}$ in.	. .	31×42 in.	each
220 lb	2590 BS.	"	"	"	"	. . 36×48 "	"
240 lb	2590 C.	"	"	"	"	. . 36×60 "	"
250 lb	2590 D.	"	"	"	"	. . 36×72 "	"
240 lb	2590 DS.	"	"	"	"	. . 42×60 "	"
275 lb	2590 E.	"	"	"	"	. . 42×72 "	"
340 lb	2590 F.	"	"	"	"	. . 42×84 "	"
330 lb	2590 H.	"	"	"	"	. . 48×72 "	"
350 lb	2590 I.	"	"	"	"	. . 48×84 "	"
375 lb	2590 K.	"	"	"	"	. . 48×96 "	"
425 lb	2590 M.	"	"	"	$1\frac{5}{8}$ in.	. . 48×120"	"

ACCESSORIES FOR AMERICAN EAGLE DRAWING TABLES.

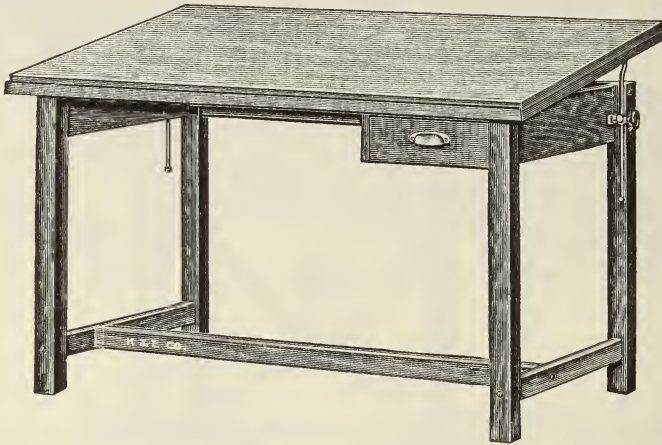
- A-3.** Folding Arm with Shelf 16 in. long × 8½ in. wide each
AO-3. " " " " and one Drawer, 7½ in. long × 14½ in.
 deep × 3½ in. high inside, with Lock "
B-3. " " " " two Drawers, " " Locks "



K & E
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FULTON DRAWING TABLES

TRADE MARK



No. 2592A

Fulton Drawing Tables are so constructed that the drawers are entirely covered to prevent dust entering from the top.

All drawing boards are furnished with hardwood protection strip in front, and side ledges screwed to the top. The screws pass through the ledge in slots with metal bushings, which allow for contraction and expansion.

All Fulton Drawing Tables are 34 in. high. Raising blocks, 3 in. high, are regularly furnished without extra charge.

Ship'g
Weight,
about

- 140 lb **2592A.** Fulton Drawing Table, oak and hardwood, in dark color high gloss finish. Basswood drawing board, 36×48 in. Drawer 12½ in. long × 24 in. deep × 4 in. high inside, with tool tray. Blueprint compartment underneath the top 26½ in. × 42 in. × 1¼ in. inside. Adjustable top..... each
- 145 lb **2592B.** Fulton Drawing Table, like 2592A, but drawing board 36×54 in. Blueprint compartment underneath the top 26½ in. × 42 in. × 1¼ in. inside..... “
- 155 lb **2592C.** Fulton Drawing Table, like 2592A, but drawing board 36×60 in. Blueprint compartment underneath the top 26½ in. × 52 in. × 1¼ in. inside..... “
- 165 lb **2592D.** Fulton Drawing Table, like 2592A, but drawing board 36×72 in. Blueprint compartment underneath the top, 26½ in. × 52 in. × 1¼ in. inside..... “

Prices cover crating for shipment.

KEUFFEL & ESSER CO. NEW YORK

K & E

REG. U. S. PAT. OFF.

HUDSON DRAWING TABLES

TRADE MARK

The workmanship and finish of Hudson Tables, to be appreciated, must be seen and compared with that of similar tables. The board itself is of selected soft white pine of uniform grain, joined by the K & E tapered wedge dovetail glue joint. It has a hardwood protection strip in front, and side ledges of patented construction. These are attached by means of screws passing through slots with metal bushings. Both sides of the board are shel-lacked. Most of the other parts of the body are of best quality oak. The drawer frames are made of white pine, oak faced; while the drawer bottoms are made of plywood. The frame and drawers have a dark color high gloss finish.

Due largely to the difficulty of properly protecting an article of the bulk and design of a piece of furniture when shipped set up, the marring and breaking of furniture in transportation is a source of great expense and annoyance. Better protection can be afforded by shipping such articles knocked down, thereby also reducing the cost of transportation.

The design and construction of the Hudson Drawing Table has been developed to the point where the article can be shipped knocked-down and assembled quickly with a minimum of labor. When set up, it is as rigid as any table on the market.

Fig. 1.

Illustrates tilting device which is practical, strong and easily adjusted. Closed-in construction under top assures dust proof drawers.

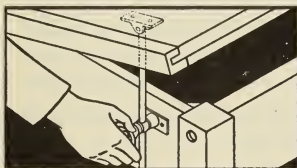


Fig. 2.

Illustrates method of connecting back rail to the legs. Two long heavy bolts through each rear leg and into rail insure ample strength and rigidity.

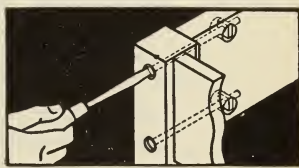


Fig. 3.

Illustrates method of joining footrail and lower side rail, notched and bolted for strength.

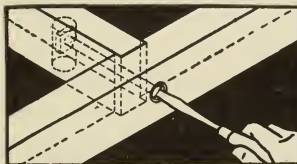


Fig. 4.

Illustrates method of joining front rail to the legs which are notched to receive end of rails and a heavy bolt for tightening.



Fig. 5.

The drawer frames are lockjointed and glued which make them very strong and durable.

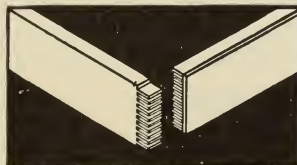
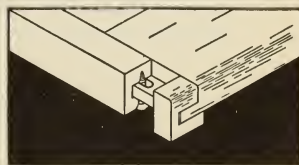


Fig. 6.

The hardwood end ledges, of patented construction, hold the board against working, while permitting its free contraction and expansion under changes in humidity.



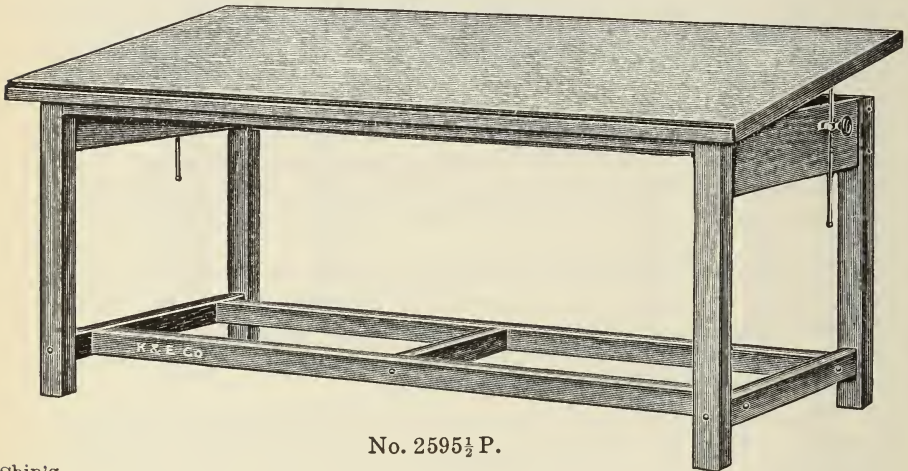


K & E
REG. U. S. PAT. OFF.

HUDSON DRAWING TABLES

TRADE MARK

WITHOUT DRAWERS.



No. 2595 $\frac{1}{2}$ P.

Ship'g
weight,
about

2593. (See pages 265, 267 and 268).

- | | | |
|--------|---------------------------------------|---|
| 170 lb | 2595P. | Hudson Drawing Table , oak and hardwood, in dark color high gloss finish. The top is a white pine drawing board, 36×72 in. with hardwood protection strip in front, and side ledges of patented construction. The table stands 34 in. high and can be made 3 in. higher by means of raising blocks.* Non-adjustable top. each |
| 165 lb | 2595$\frac{1}{2}$P. | Hudson Drawing Table like No. 2595P. but with Adjustable top “ |
| 200 lb | 2596P. | Hudson Drawing Table , like No. 2595P, but with drawing board 42×84 in. Non-adjustable top. “ |
| 205 lb | 2596$\frac{1}{2}$P. | Hudson Drawing Table , like No. 2596P, but with Adjustable top. “ |

All Hudson Drawing Tables are so constructed that, whether the top is fixed or made adjustable, the drawers are entirely covered against dust entering from the top.

Prices cover crating for shipment.

*Raising blocks, 3 in. high, are regularly furnished without extra charge.

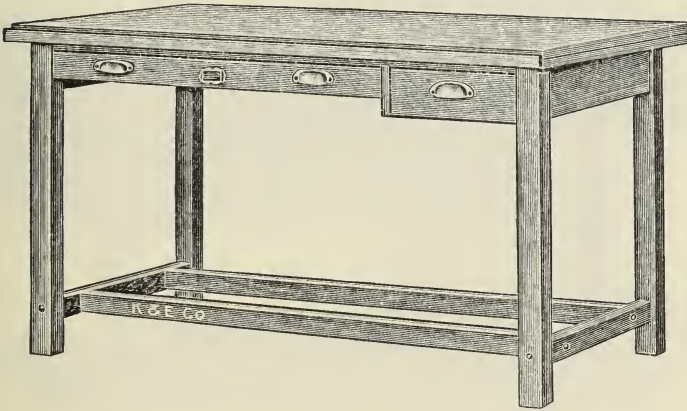


K & E
REG. U. S. PAT. OFF.

HUDSON DRAWING TABLES

TRADE MARK

WITH ONE TOOL DRAWER AND ONE LONG DRAWER.



No. 2593R.

Ship'g
Weight
about

- | | |
|--------|---|
| 160 lb | 2593R. Hudson Drawing Table, oak and hardwood, in dark color high gloss finish. The top is a drawing board of white pine 36×60 in., with hardwood protection strip in front, and hardwood ledges of patented construction. Large drawer 36¾ in. long × 26 in. deep × 2 in. high inside; small drawer 12¼ in. long × 24 in. deep × 4 in. high inside, with tool tray. The table stands 34 in. high.* Non-adjustable top .....each |
| 165 lb | 2593½R. Hudson Drawing Table, like No. 2593R, but with Adjustable Top and blueprint compartment underneath the top, 26½ in. × 52 in. × 1¼ in. high inside “ |
| 210 lb | 2595R. Hudson Drawing Table, similar to No. 2593R, but with drawing board 36×72 in. Large drawer 43 in. long × 26 in. deep × 2 in. high inside; small drawer 17¾ in. long × 24 in. deep × 4 in. high inside, with tool tray. Non-adjustable top “ |
| 230 lb | 2595½R. Hudson Drawing Table, like No. 2595R, but with Adjustable top and blueprint compartment underneath the top, 26½ in. × 64 in. × 1¼ in. high inside..... “ |

All Hudson Drawing Tables are so constructed that, whether the top is fixed or made adjustable, the drawers are entirely covered against dust entering from the top.

Prices cover crating for shipment.

*Raising blocks, 3 in. high, are regularly furnished without extra charge.

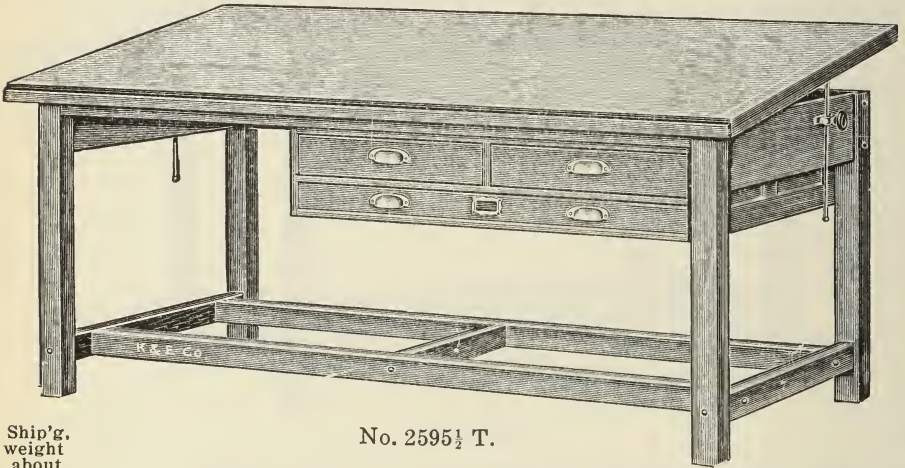


K & E
REG. U. S. PAT. OFF.

HUDSON DRAWING TABLES

TRADE MARK

WITH TWO TOOL DRAWERS AND ONE LONG DRAWER.



Ship'g.
weight
about

No. 2595 $\frac{1}{2}$ T.

- 245 lb **2595T.** Hudson Drawing Table, oak and hardwood, in dark color high gloss finish. The top is a white pine drawing board, 36×72 in. with hardwood protection strip in front, and side ledges of patented construction. Two drawers 17 $\frac{3}{4}$ in. long × 24 $\frac{3}{4}$ in. deep × 3 $\frac{3}{4}$ in. high inside; one with partitioned sliding tray. The third drawer is 37 $\frac{3}{4}$ in. long × 24 $\frac{3}{4}$ in. deep × 2 in. high inside. The table stands 34 in. high and can be made 3 in. higher by means of raising blocks.* **Non-adjustable top.** each
- 245 lb **2595 $\frac{1}{2}$ T.** Hudson Drawing Table, like No. 2595T, but with **Adjustable top.** “
- 300 lb **2596T.** Hudson Drawing Table, like No. 2595T, but with drawing board 42×84 in. Two drawers 20 $\frac{1}{4}$ in. long × 32 in. deep × 3 $\frac{3}{4}$ in. high inside; one with partitioned sliding tray. The third drawer is 42 $\frac{3}{4}$ in. long × 32 in. deep × 2 in. high inside. **Non-adjustable top.** “
- 320 lb **2596 $\frac{1}{2}$ T.** Hudson Drawing Table, like No. 2596T, but with **Adjustable top.** “

All Hudson Drawing Tables are so constructed that, whether the top is fixed or made adjustable, the drawers are entirely covered against dust entering from the top.

Prices cover crating for shipment.

*Raising blocks, 3 in. high, are regularly furnished without extra charge.



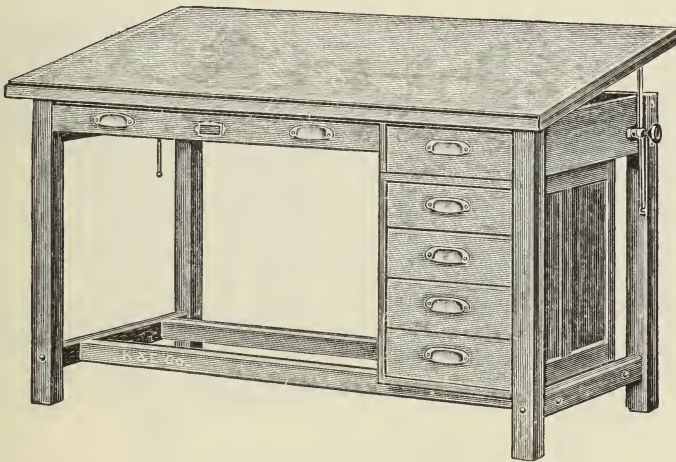
K & E

REG. U. S. PAT. OFF.

HUDSON DRAWING TABLES

TRADE MARK

WITH ONE TOOL DRAWER, ONE LONG DRAWER AND ONE
FOUR-DRAWER SECTION.



No. 2593 $\frac{1}{2}$ RH.

Ship'g
Weight,
about

- 225 lb **2593RH** Hudson Drawing Table, oak and hardwood, in dark color high gloss finish. The top is a drawing board of white pine 36×60 in., with hardwood protection strip in front, and side ledges of patented construction. Large drawer 36 $\frac{3}{4}$ in. long×26 in. deep×2 in. high inside; small drawer 12 $\frac{1}{4}$ in long×24 in. deep×4 in. high inside, with tool tray. One 4 drawer section, each drawer 11 $\frac{1}{2}$ in. long×22 $\frac{1}{2}$ deep×4 in. high inside. The table stands 34 in. high and can be made 3 in. higher by means of raising blocks.* Non-adjustable top. each
- 230 lb **2593 $\frac{1}{2}$ RH.** Hudson Drawing Table, like No. 2593RH, but with Adjustable top and blueprint compartment underneath the top, 26 $\frac{1}{2}$ in. × 52 in. × 1 $\frac{1}{4}$ in. high inside. “
- 275 lb **2595RH.** Hudson Drawing Table, similar to No. 2593RH, but with drawing board 36×72 in. Large drawer 43 in. long × 26 in. deep × 2 in. high inside; small drawer 17 $\frac{3}{4}$ in. long × 24 in. deep × 4 in. high inside, with tool tray. Non-adjustable top. “
- 275 lb **2595 $\frac{1}{2}$ RH.** Hudson Drawing Table, like No. 2595RH, but with Adjustable top and blueprint compartment underneath the top, 26 $\frac{1}{2}$ in. × 64 in. × 1 $\frac{1}{4}$ in. high inside. “

All Hudson Drawing Tables are so constructed that, whether the top is fixed or made adjustable, the drawers are entirely covered against dust entering from the top.

Prices cover crating for shipment.

*Raising blocks, 3 in. high, are regularly furnished without extra charge.



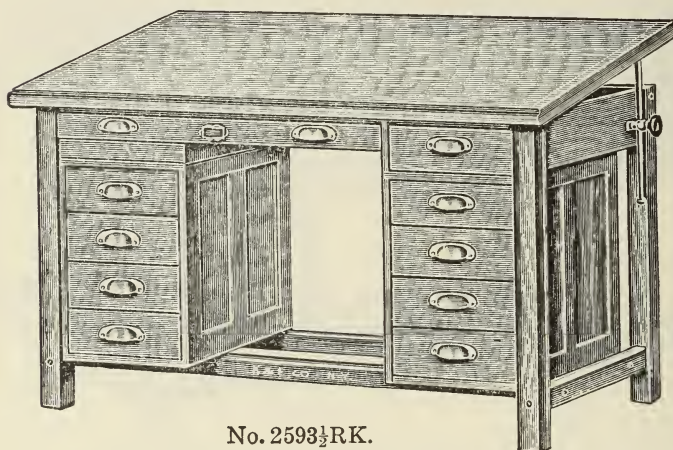
K & E

REG. U. S. PAT. OFF.

HUDSON DRAWING TABLES

TRADE MARK

WITH ONE TOOL DRAWER, ONE LONG DRAWER AND TWO
FOUR-DRAWER SECTIONS.



No. 2593 $\frac{1}{2}$ RK.

Ship'g.
weight
about

- 290 lb **2593RK.** Hudson Drawing Table, oak and hardwood, in dark color, high gloss finish. The top is a drawing board of white pine 36 × 60 in., with hardwood protection strip in front, and hardwood ledges of patented construction. Large drawer 36 $\frac{1}{2}$ in. long × 26 in. deep × 2 in. high inside; small drawer 12 $\frac{1}{4}$ in. long × 24 in. deep × 4 in. high inside, with tool tray. Two 4-drawer sections, one section at the right and one at left side, each drawer 11 $\frac{1}{2}$ in. long × 22 $\frac{1}{2}$ in. deep × 4 in. high inside. The table stands 34 in. high.* **Non-adjustable top** each
- 290 lb **2593 $\frac{1}{2}$ RK.** Hudson Drawing Table, like No. 2593RK, but with **Adjustable top**, and blueprint compartment underneath the top, 26 $\frac{1}{2}$ in. × 52 in. × 1 $\frac{1}{4}$ in. inside. “
- 325 lb **2595RK.** Hudson Drawing Table, like No. 2593RK, but with drawing board 36 × 72 in. Large drawer 43 in. long × 26 in. deep × 2 in. high inside; small drawer 17 $\frac{3}{4}$ in. long × 24 in. deep × 4 in. high inside, with tool tray. **Non-adjustable top**. “
- 325 lb **2595 $\frac{1}{2}$ RK.** Hudson Drawing Table, like No. 2595RK, but with **Adjustable top** and blueprint compartment underneath the top, 26 $\frac{1}{2}$ in. × 64 in. × 1 $\frac{1}{4}$ in. high inside. “

All Hudson Drawing Tables are so constructed that, whether the top is fixed or made adjustable, the drawers are entirely covered against dust entering from the top.

Prices cover crating for shipment.

*Raising blocks, 3 in. high, are regularly furnished without extra charge.

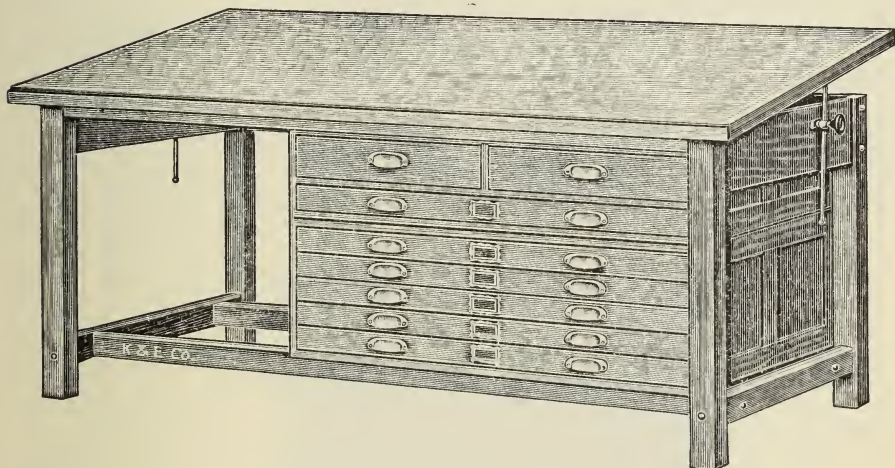


K & E
REG. U. S. PAT. OFF.

HUDSON DRAWING TABLES

TRADE MARK

WITH TWO TOOL DRAWERS, ONE LONG DRAWER AND ONE
FIVE-DRAWER SECTION.



Shig'p
Weight,
about

No. 2596 $\frac{1}{2}$ T with No. 2598B.

- 340 lb **2595T** with **2598BS**. Hudson Drawing Table, oak and hardwood, in dark color high gloss finish. The top is a white pine drawing board 36×72 in. with hardwood protection strip in front and side ledges of patented construction. Two drawers $17\frac{3}{4}$ in. long $\times 24\frac{3}{4}$ in. deep $\times 3\frac{3}{4}$ in. high inside; one with partitioned sliding tray. The third drawer is $37\frac{3}{4}$ in. long $\times 24\frac{3}{4}$ in. deep $\times 2$ in. high inside. One 5-drawer section, No. 2598 BS; each drawer $37\frac{3}{4}$ in. long $\times 25$ in. deep $\times 2$ in. high inside. Dark color, high gloss finish. The table stands 34 in. high.* Non-adjustable top. each
- 355 lb **2595 $\frac{1}{2}$ T** with **2598BS**. Hudson Drawing Table, like No. 2595T with 2598BS, but with Adjustable top. “
- 420 lb **2596T** with **2598B**. Hudson Drawing Table, similar to No. 2595T with 2598BS, but with drawing board 42×84 in., and two drawers $20\frac{1}{4}$ in. long $\times 32$ in. deep $\times 3\frac{3}{4}$ in. high, inside; one with partitioned sliding tray. The third drawer is $42\frac{3}{4}$ in. long $\times 32$ in. deep $\times 2$ in. high inside. One 5-drawer section, No. 2598B; each drawer $42\frac{3}{4}$ in. long $\times 32$ in. deep $\times 2$ in. high inside. Dark color, high gloss finish. Non-adjustable top. “
- 435 lb **2596 $\frac{1}{2}$ T** with **2598B**. Hudson Drawing Table, like No. 2596T with 2598B, but with Adjustable top. “

Prices cover crating for shipment.

*Raising blocks, 3 in. high, are regularly furnished without extra charge.

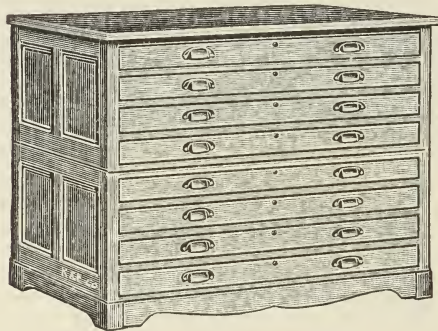
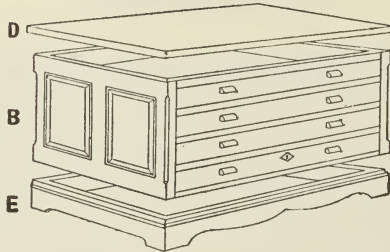


K & E

REG. U. S. PAT. OFF.

CHESTS OF DRAWERS, IN SECTIONS.

QUARTERED OAK, FINEST GOLDEN OAK FINISH.



No. 2597B. B. D. E.

These **Sectional Chests**, consisting of base, sections, and top, admit of arbitrary change in the capacity of the composite chest, in much the same manner as such changes may be effected in the well-known sectional book cases. They are of **quartered oak**, golden oak finish, and of very best workmanship.

Each drawer in **Section B** is provided with a lock. Section B is 16½ inches and Base E is 3½ inches high.

The drawers have a guard across the rear end to prevent papers from working out.

Ship'g
Weight,
about

190 lb	2597B.	Regular Section , 4 Drawers 42 in. long × 31 in. deep × 2½ in. high inside.....	each
60 lb	2597D.	Polished Hardwood Top , 48 in. long × 35 in. wide	"
40 lb	2597E.	" " Base ,	"

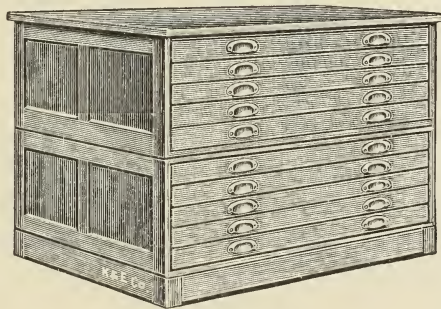
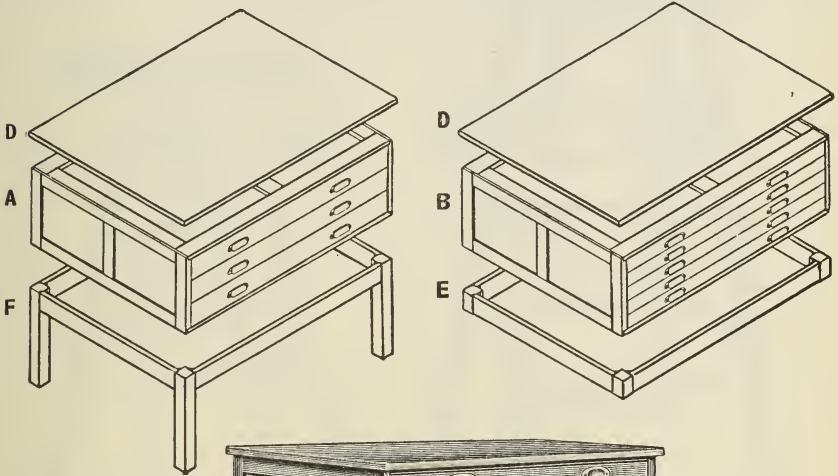
Prices cover crating for shipment.



K & E

REG. U. S. PAT. OFF.

CHESTS OF DRAWERS, IN SECTIONS.



No. 2598B. B. D. E.

These Sectional Chests, consisting of base, drawer sections and top, admit of arbitrary change in the capacity of the composite chest. The chests are oak, in dark color, high gloss finish. The sides and backs of the drawers are white pine, lock-jointed at the four corners, making them exceptionally strong and durable. The drawer fronts are oak.

Ship'g
Weight,
about

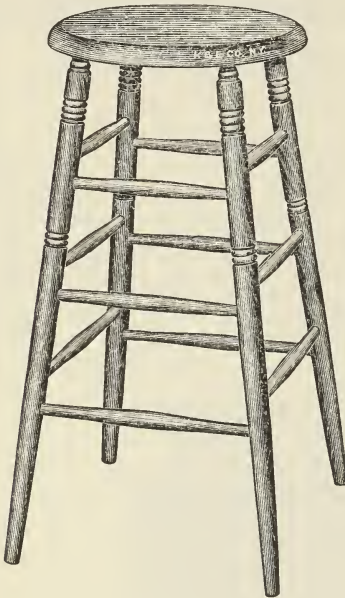
Sections A and B are 14½ inches high.

The drawers have a guard across the rear end to prevent papers from working out.

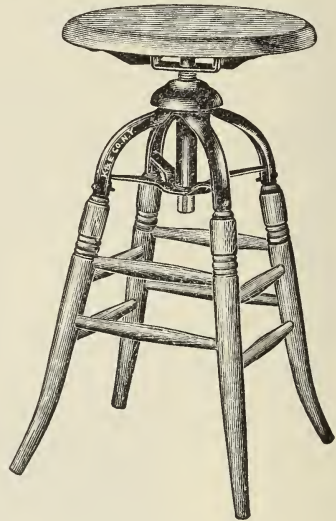
119 lb	2598A.	Section, 3 Drawers 42¾ in. long × 32 in. deep × 3⅝ in. high inside.....	each
129 lb	2598B.	Section, 5 Drawers, 42¾ in. long × 32 in. deep × 2 in. high inside “	
107 lb	2598BS.	Section, 5 Drawers, 37¾ in. long × 25 in. deep × 2 in. high inside. This section fits only Hudson Tables Nos. 2595T and 2595½T, and cannot be fitted with the tops or bases listed below.....	“
53 lb	2598C.	Hardwood Top, with frame, 45⅞ in. long × 35½ in. wide × 3 in. high.....	“
45 lb	2598D.	Hardwood Top, 47½ in. long × 35½ in. wide.....	“
28 lb	2598E.	Hardwood Base, 3½ in. high.....	“
60 lb	2598F.	Hardwood Sanitary Base, 18 in. high.....	“
82 lb	2598G.	Hardwood Base with Drawer, 42¾ in. long × 32 in. deep × 3⅝ in. high inside.....	“
25 lb	2598H.	Hardwood Sanitary Base, 5¾ in. high.....	“



DRAFTSMAN'S STOOLS



No. 2602.



No. 2603.

Ship'g
Weight
about

20 lb. **2602.** Draftsman's Stool, hardwood, light office finish, wood top 13 in. dia., height 30 in. each

30 lb. **2603.** Draftsman's Adjustable Stool, hardwood, light office finish wood top 14 in. dia., height adjustable from 26 to 30 inches each

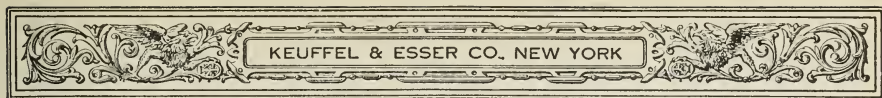
DUST COVERS FOR DRAWING TABLES.

These Dust Covers are of black water-proofed cloth with a roller. Brackets are provided to hold the rolled cloth at the back of the table, so as to be entirely off the table top when the table is in use.

2615C. Dust Covers, 36 × 60 in. each

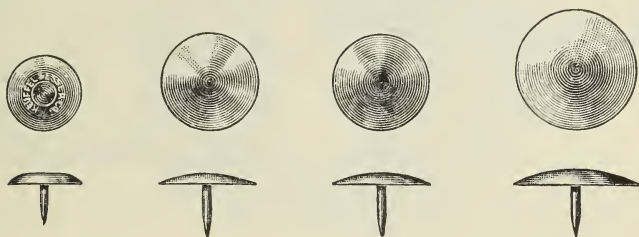
D. “ “ 36 × 72 “ “

F. “ “ 42 × 84 “ “



K & E
REG. U. S. PAT. OFF.

THUMB TACKS.



No. 2622.

2641.

2651.

2662.

FINE NICKEL SILVER TACKS.

TOOL STEEL POINTS, SCREWED AND RIVETED.

One Dozen on a Block.

2622.	$\frac{3}{16}$ in. diam.	doz.
2624.	$\frac{1}{2}$ " "	"
2626.	$\frac{5}{16}$ " "	"

NICKEL SILVER TACKS.

HIGHLY FINISHED. STEEL POINTS SWAGED.

One Box of 100

2640.	$\frac{3}{16}$ in. diam.	box
2641.	$\frac{1}{2}$ " "	"
2642.	$\frac{5}{16}$ " "	"

One Dozen on a Block.

2643.	$\frac{3}{16}$ in. diam.	doz.
2644.	$\frac{1}{2}$ " "	"
2645.	$\frac{5}{16}$ " "	"

BRASS TACKS.

HIGHLY FINISHED. STEEL POINTS SWAGED.

One Box of 100.

2650.	$\frac{3}{16}$ in. diam.	box
2651.	$\frac{1}{2}$ " "	"

One Dozen on a Block.

2653.	$\frac{3}{16}$ in. diam.	doz.
2654.	$\frac{1}{2}$ " "	"

STEEL TACKS.

NICKELPLATED. STEEL POINTS SWAGED.

One Box of 100.

2660.	$\frac{3}{16}$ in. diam.	box
2661.	$\frac{1}{2}$ " "	"
2662.	$\frac{5}{16}$ " "	"

One Dozen on a Block.

2663.	$\frac{3}{16}$ in. diam.	doz.
2664.	$\frac{1}{2}$ " "	"
2665.	$\frac{5}{16}$ " "	"



K & E

REG. U. S. PAT. OFF.

STAMPED STEEL TACKS.



No. 2677.



2678



2679.



K & E Stamped Steel Tacks are made of one piece of tough, hardened steel. They are finished so that they will not rust easily. They have **needle points**; so that they can be easily inserted and will not make unsightly holes in the drawing board. These tacks can be driven into hardwood without bending or breaking.

PLAIN

One Box of 12.

2677 $\frac{1}{2}$. $\frac{3}{8}$ in. diam. box

One Box of 25.

2677-0. $\frac{3}{8}$ in. diam. box

One Box of 100.

2677-2. $\frac{3}{8}$ in. diam. "

2678. $\frac{7}{16}$ " " "

2679. $\frac{9}{16}$ " " "

One Box of 50.

2677-1. $\frac{3}{8}$ in. diam. box

One Dozen on a Block.

2677C. $\frac{3}{8}$ in. diam. doz.

2678C. $\frac{7}{16}$ " " "

2679C. $\frac{9}{16}$ " " "

NICKELPLATED.

One Box of 100.

2677N. $\frac{3}{8}$ in. diam. box

2678N. $\frac{7}{16}$ " " "

2679N. $\frac{9}{16}$ " " "

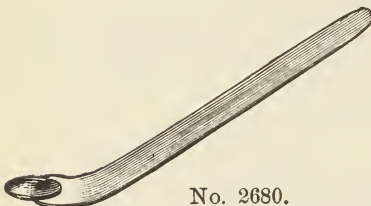
One Dozen on a Block.

2677NC. $\frac{3}{8}$ in. diam. doz.

2678NC. $\frac{7}{16}$ " " "

2679NC. $\frac{9}{16}$ " " "

TACK LIFTER.



No. 2680.

A handy and simple instrument for extracting thumb tacks. The end of the lifter is inserted under the head of the tack, which it takes out without bending the point or wrenching off the head, as is frequently the case when a knife is used.

The handle of this instrument is a Paperknife, useful for removing drawings which have been glued to the board, etc.

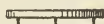
(See also Lead Pencil File and Tack-lifter page 303).

2680. Tacklifter and Paper Knife, Brass, Nickelplated, 5 $\frac{3}{4}$ in. each

HORNCENTERS.



No. 2690.



2691.

2690. Horncenter, plain, $\frac{1}{2}$ in. diam. each

2691. Horncenter, with nickel silver rim, $\frac{3}{4}$ in. diam. "

BEST-TEST
MADE IN U.S.A. REGISTERED

WARRANTY

PAPER CEMENT
A Real Adhesive

SUITED FOR THE
PAPER MANUFACTURING
INDUSTRY
FOR ALL PURPOSES

SUNNY HOLLOW, NEW YORK
MADE IN U.S.A.

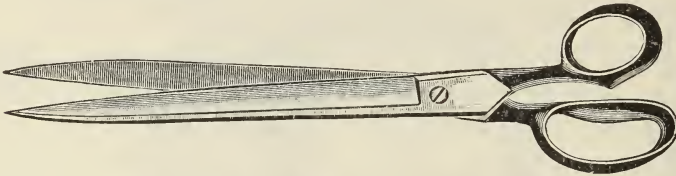
BEST-TEST PAPER CEMENT
MADE IN U.S.A.



2695	Best Test Paper Cement, 2 oz. tube	per tube
2695C.	" " " " , 4 oz. (brush in cap) can	per can
D.	" " " " , $\frac{1}{2}$ pint can	" "
E.	" " " " , 1 pint can	" "
F.	" " " " , 1 quart can	" "
G.	" " " " , 1 gallon can	" "



PAPER SHEARS.



Hardened and tempered
music-wire spring and
self-lubricating steel stud.



Thimble holding
the coiled spring
and stud.

In these shears, a hollow thimble, containing a music-wire coil spring and a self-lubricating steel stud placed between the blades, insures an automatic upward tension which takes up the wear under the screw thread, thereby automatically keeping both cutting edges in perfect alignment.

2698-14. Paper Shears, Japanned Handles, Nickeled Blades, 14 in. long, each

2698-16. Paper Shears, Japanned Handles, Nickeled Blades, 16 in. long, “

PAPER CUTTER.

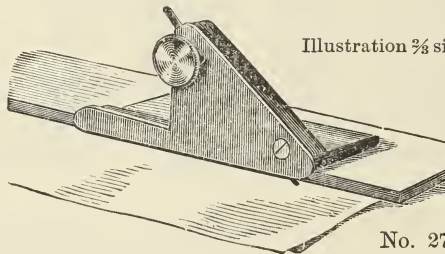


Illustration $\frac{3}{4}$ size.

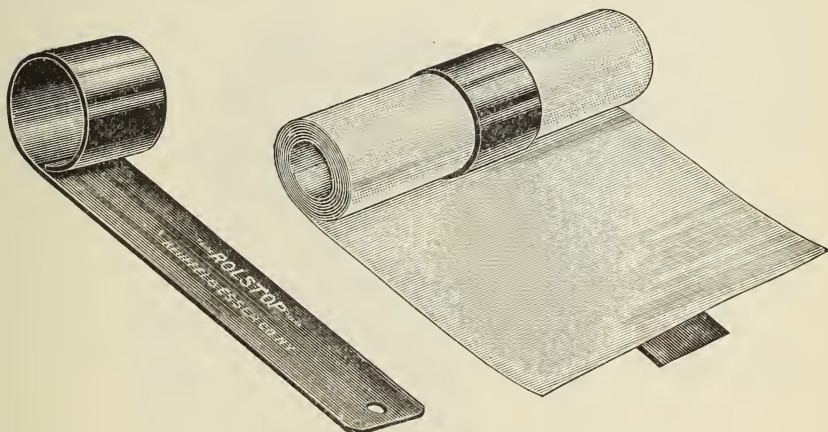
No. 2701.

This little instrument is of important service to Draftsmen for cutting drawings from the board as well as for cutting any kind of paper or Bristol board. It is slid along the ruler or T Square and will not injure its edges, as an ordinary knife would do. The blade of this Cutter can be adjusted to cut only the thickness of the paper without striking the drawing board. The knife is set and clamped, and can be removed for sharpening.

2701. Handy Paper Cutter, Nickelplated each



ROLSTOP. TRADE MARK



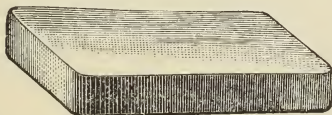
No. 2703

This is a simple device which keeps blue prints or tracings from rolling or unrolling while they are being examined, checked or altered. It is superior to weights, tacks or clips, since it admits of bringing any portion of the drawing into view by a simple movement in practically the same way as if the sheet was mounted upon a roller. A pair of these devices form a handy means of holding a rolled sheet for ready reference and in the smallest possible space.

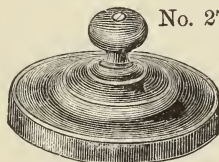
2703. Rolstop, green celluloid. each

PAPERWEIGHTS.

No. 2710.



No. 2715.



2705. Paperweight. Shot in lined chamois bag impervious to lead dust; a very practical paperweight, about 2 pounds. each

2710. Lead Paperweight, covered with leather, about $4 \times 2\frac{1}{4} \times \frac{3}{4}$ in., about $2\frac{3}{4}$ pounds, each

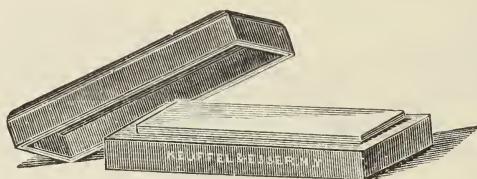
2715. Iron Paperweight, round, with knob, about 2 pounds, each

This Iron Paperweight is finely finished and cloth lined. The knobs are of nickelplated brass.



ARKANSAS OIL STONES.

No. 2720.



- 2720.** Arkansas Oil Stone, hard, in polished wood case with cover,
about $3\frac{1}{2} \times \frac{7}{8}$ in. each
- 2730N.** Arkansas Oil Stone, knife blade, about $3\frac{1}{2} \times \frac{3}{4} \times \frac{1}{4}$ in. “

TUBES FOR STORING PHOTOPRINT PAPER.



No. 2732.

These tubes are of tin, with well fitting covers, and are the best and most practical receptacle for storing cut rolls of photo paper, because they exclude both light and moisture. They are well adapted also for storing tracings, plans, drawings, etc. These tubes all have pull-off covers.

- | | | | | | |
|---------------|--------------------------|-----|----|----|--------|
| | Tubes for Storing Paper, | for | 30 | 36 | 42 in. |
| 2732. | for 10 yard rolls, each | | | | |
| 2732X. | for 50 yard rolls, each | | | | |
- Nos. 2732 and 2732X are old Nos. 219 and 219X.

KEUFFEL & ESSER CO., NEW YORK

KECO

REG. U. S. PAT. OFF.

WATERPROOF DRAWING INK



KECO Waterproof Drawing Inks were developed to meet the increasing need for more satisfactory inks to be used in connection with modern reproduction processes.

KECO Black Waterproof Drawing Ink produces dense black lines which are entirely opaque against light, even when drawn on tracing cloth. Hence, reproductions made on blue-print machines from originals drawn with **KECO** ink have sharp, clean lines. When used to cover large areas, **KECO** will not crack or spall.

KECO Colored Waterproof Drawing Inks are the most light-fast, brilliant drawing inks ever offered to draftsmen and artists. Since they can be blended, any desired color or tint may be produced. Washes run over them, after they are dry, will not smear them.

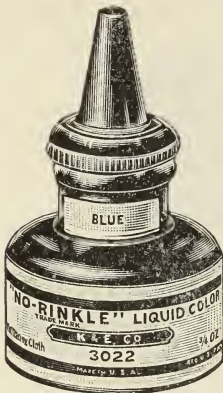
KECO 3/4 ounce bottles are furnished with a newly designed rubber-top filler, with non-shatterable tube (pat. pending).* Since this filler will operate satisfactorily only in **KECO** bottles, it should not be ordered for use with any others.

	3/4 oz.	each	1/2 PT.	each	PINT	each	QUART	each
Black,	3000		3000D		3000E		3000F	
Brown,	3001		3001D		3001E		3001F	
Blue,	3002		3002D		3002E		3002F	
Green,	3003		3003D		3003E		3003F	
Scarlet,	3004		3004D		3004E		3004F	
Carmine,	3005		3005D		3005E		3005F	
Yellow,	3006		3006D		3006E		3006F	
Orange,	3008		3008D		3008E		3008F	
Violet,	3009		3009D		3009E		3009F	

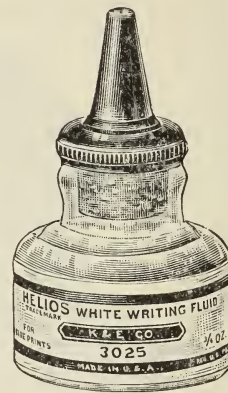
*Note: This stopper is designed specifically for the **KECO** 3/4 oz. bottle, and will not hold in any other.

KEUFFEL & ESSER CO., NEW YORK

LIQUID COLORS AND WRITING FLUIDS.



No. 3022



No. 3025

“NO-RINKLE” LIQUID COLORS.

TRADE MARK

No-Rinkle-Blak and **No-Rinkle Colors** may be applied with a brush or spray to large areas on tracing cloth, tracing paper and drawing paper, without producing any wrinkles whatsoever, and thereby insuring perfect contact in photo printing. **No-Rinkle-Blak** is particularly recommended for blocking out unwanted sections of brown-print negatives; while the colors, since they spread evenly, are ideal for filling in areas on maps and graphic charts.

No-Rinkle Liquid Colors can be used in the same manner as water-colors; their brilliant hues making them particularly desirable for that type of work. Only **No-Rinkle Thinner** should be employed for diluting or blending these colors.

3021. NO-RINKLE-BLAK. A permanent black liquid; $\frac{3}{4}$ oz. bottle, per bottle
No. 3021 is old No. 3012.

3022. NO-RINKLE Liquid Colors, Brown, Blue, Green, Scarlet,
Carmine, Yellow, Orange, Violet, $\frac{3}{4}$ oz. bottle “ “
No. 3022 is old No. 3013.

3023. NO-RINKLE Thinner, for diluting and blending **NO-RINKLE**
Liquid Colors; $\frac{3}{4}$ oz. bottle “ “

WRITING FLUIDS

FOR MAKING ALTERATIONS AND ADDITIONS ON PHOTO PRINTS.

3025W. HELIOS Writing Fluid, for Blueprints, white, $\frac{3}{4}$ oz. bottle . . . per bottle
TRADE MARK

R.	do.	do.	do.	do.	do.	red	“	“	“	“
Y.	do.	do.	do.	do.	do.	yellow	“	“	“	“

M. MADURO Writing Fluid, for Maduro prints, white, $\frac{3}{4}$ oz. bottle . “ “
TRADE MARK

No. 3025 is old No. 240.



INK REMOVERS



No. 3032



No. 3035

3032. INKOFF, for removing ink lines and colored pencil from tracing cloth; one oz. bottle per bottle
REG. U. S. PAT. OFF.
 No. 3032 is old No. 3017.

3035. K & E Profile Erasing Fluid, for removing the engraved lines from K & E Profile and Cross-section Tracing Cloth; one oz. bottle “ “



No. 3040



No. 3042

POUNCE

When cloth will not take ink readily, dust on a small quantity of the pounce and rub it in evenly with a soft fabric until the cloth has lost its excessive gloss. The pounce must be thoroughly removed before applying the ink.

3040. Pounce for Tracing Cloth, in shakers each
 No. 3040 is old No. 166.

TRANSLUX

TRADE MARK

Translux, when applied to paper tracings or brown print negatives, greatly increases their transparency, enabling blue-prints or brown-prints to be made from them with much greater rapidity than would otherwise be the case. **Translux**, when applied to drawing paper makes it translucent enough for prints to be made through it. **Translux** will not, in any way, injure drawings or the resulting prints.

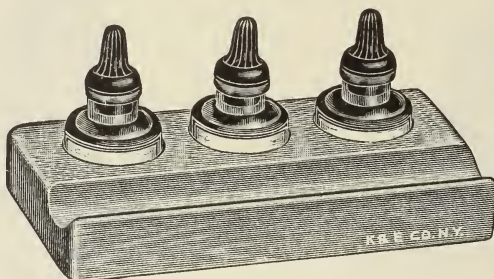
3042C. Translux in Tins, one quarter pint each

E.	do.	do.	“	pint	“
F.	do.	do.	“	quart	“
H.	do.	do.	“	half gallon	“
G.	do.	do.	“	gallon	“

No. 3042 is old No. 218.



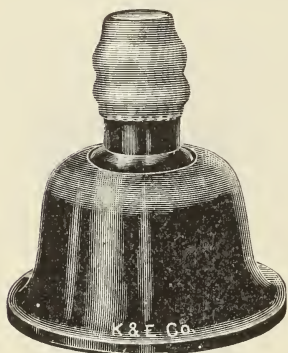
INK STAND.



3045.

- 3045. Hardwood Stand**, $4 \times 8 \times 1\frac{1}{4}$ in., to hold 3 bottles of KECO Ink . . . each
No. 3045 is old No. N3010.

INK-BOTTLE HOLDERS.



3048.



3049.

- 3048. Ink-bottle Holder and Paperweight**, iron, enameled,
weight about 2 pounds each

The bottle is inserted from below and secured by a bayonet flange. It will hold any of the $\frac{1}{4}$ oz. drawing ink bottles generally used.

No. 3048 is old No. 3018.

- 3049. Ink-bottle Holder**, steel, bronzed, weight about $6\frac{1}{2}$ oz., each

This holder is adapted for KECO Inks. The bottle is inserted from below and held in place by a steel spring. It will hold any of the $\frac{1}{4}$ oz. drawing ink bottles generally used.

No. 3049 is old No. 3019.

KEUFFEL & ESSER CO., NEW YORK

WASH BRUSHES.

Since the quality of brushes cannot be exactly described, and since illustrations cannot be made to show quality, it is stated that all the brushes listed are the very best of their respective kind. They are always of the kind of hair indicated, without adulteration or substitution, and each size contains the proper quantity of hair.



Illustrations full size.

- 3120. Black Sable, round, in Albata, black Handle**
 No. 0N 2N 4N 6N each
- 3121. Red Sable, round, in Albata, black Handle,**
 No. 0N 1N 2N 3N 4N 5N 6N 7N 8N 9N 12N each

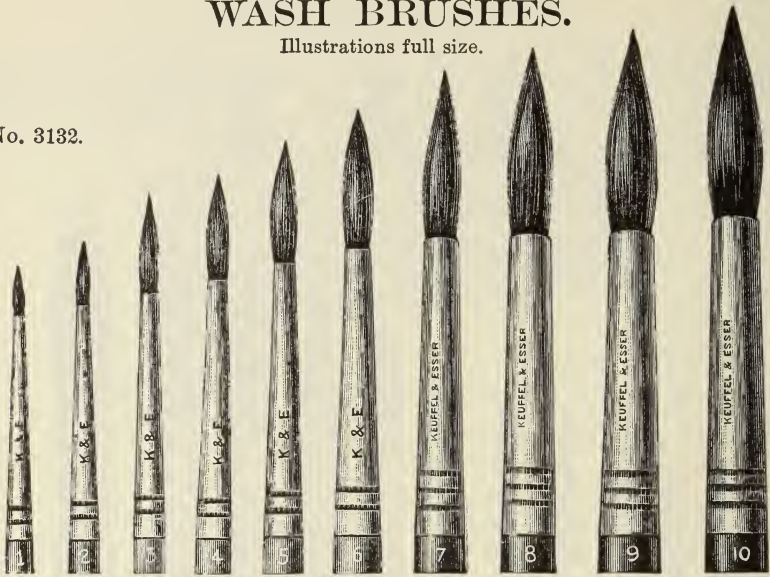
The above are **real sable** brushes, and contain no adulterant of any kind. Real sable brushes form a finer point, retain this point longer than others, and **remain elastic**.



WASH BRUSHES.

Illustrations full size.

No. 3132.

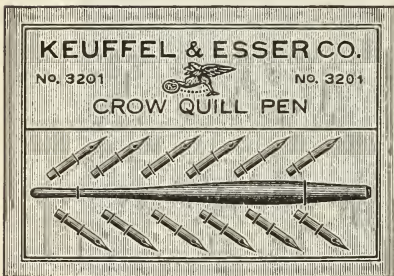


3132. Camel Hair, in Tin, red Handle,

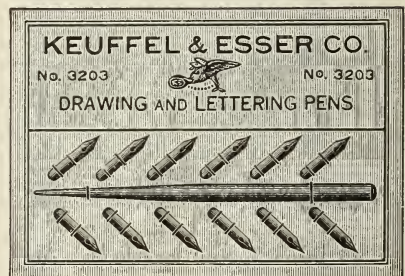
No. 1 2 3 4 5 6 7 8 9 10 each

K & E STEEL PENS.

REG. U. S. PAT. OFF.



No. 3201.



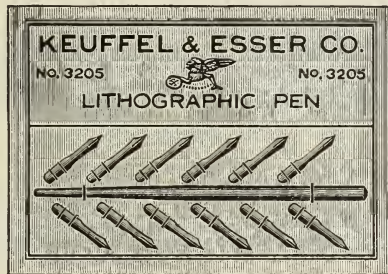
3203.

Pens Nos. 3200 and 3202 are specially made for Draftsmen, for drawing and lettering on drawing paper which has a more or less coarse surface. They have longer nibs and less sharp points than most others, possess great elasticity and permit of more rapid lettering or drawing, without scratching or catching in the grain of the paper. Draftsmen will prefer these pens to any other kind, since most others are intended principally for drawing on stone.

- | | | |
|-------|--|------|
| 3200. | K & E Crow Quill Pens, 1 doz. in a box | box |
| 3201. | K & E Crow Quill Pens, 1 doz. pens No. 3200 and Holder, on a card | card |
| 3202. | K & E Drawing and Lettering Pens, 1 doz. in a box | box |
| 3203. | K & E Drawing and Lettering Pens, 1 doz. pens No. 3202 and Holder, on a card | card |



K & E
REG. U. S. PAT. OFF.
STEEL PENS.

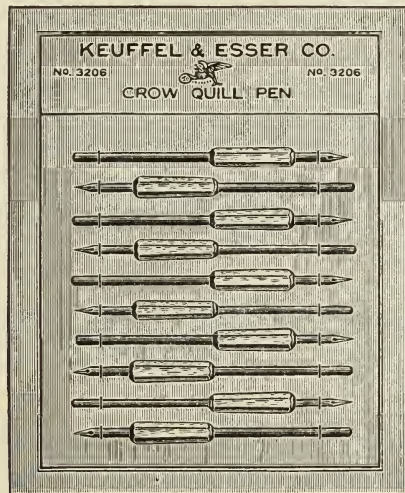


No. 3205.

Pens No. 3204 differ from all other Lithographic Pens in having shorter (and therefore firmer) nibs, and points of the utmost fineness.

3204. K & E Lithographic Pens, 1 doz. in a box, box.

3205. K & E Lithographic Pens, 1 doz. pens No. 3204 and Holder,
on a card card



No. 3206.



3206. K & E Crow Quill Pens, (No. 3200), in improved Holders
with cork finger piece, each

Card of 10 Pens No. 3206, in improved Holders with
cork finger piece per card



STEEL PENS.

JOSEPH GILLOTT'S.

A "card" has 12 pens and 1 holder.

- 3210. Lithographic Crow Quill Pens, (No. 659) card
- 3210B. do. do. do. (No. 659 B) one gross per box
- 3211. Superfine long shoulder Crow Quill Pens, (No. 850) card
- 3212. Lithographic Pens, (No. 290) "
- 3212B. do. do. (No. 290 B) one gross per box
- 3213. Mapping Pens, (No. 291) card
- 3213B. do. do. (No. 291 B), one gross per box
- 3214. Mapping or Ladies' Pens, (No. 170) doz.
- 3215. Lettering Pens, (No. 303) "
- 3216. do. (No. 404) "

PENHOLDERS.

These holders for crow quill and lettering pens are of the thickness of an ordinary penholder, a great improvement over the thin sticks generally used.



No. 3220.

- 3220. K & E Improved Crow Quill Penholder, each



No. 3221.

- 3221. K & E Improved Lettering Penholder, each



BARCH-PAYZANT (FREEHAND) LETTERING PENS.



Cork Grip furnished with Nos. 7 and 8.

11 Widths of Lines.



Barch-Payzant Lettering Pens are useful for freehand lettering on mechanical and architectural drawings. They are also widely employed in the commercial field for making up price tags, show cards, etc.

These pens are designed to produce the same gauge of lines regardless of the direction in which the pen is moved in lettering. Hence, letters of any desired width can be formed with a single stroke of a Barch-Payzant pen. An ink reservoir of generous size makes frequent re-filling unnecessary.

BRASS, WOOD HANDLES.

3224. Barch-Payzant Lettering Pens, Brass, Nos. 0, 00, 000 each

3224. “ “ “ Nos. 1, 2, 3, 4, 5, 6, “

STEEL, CHROMIUM PLATED, ALUMINUM HANDLES.

3224-7. Minute Barch-Payzant Lettering Pen, Steel, Chromium Plated “

3224-8. “ “ “ “ “ “

SETS.

N 3225. Set of six pens, Nos. 1, 3, 5, 6 (Brass), 7, 8 (Steel, chromium plated), in paper box set

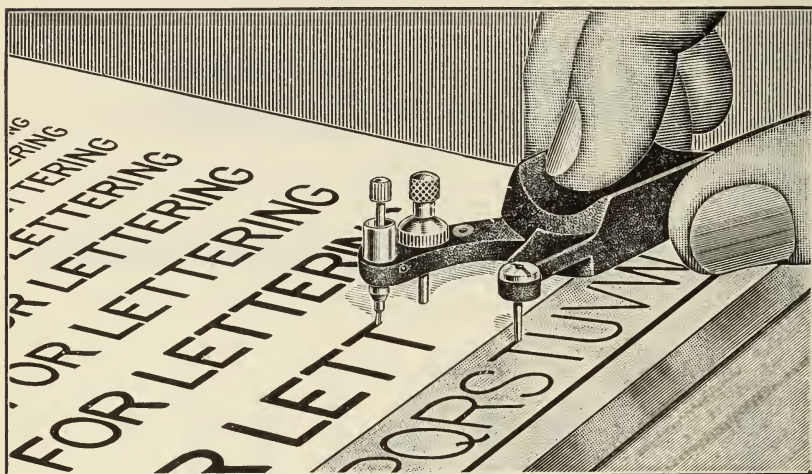
3226. Leatheret Finish Case to hold assortment of any 6 pens, each

NOTE: Set of any six pens Nos. 1 to 8 furnished in paper box.
For total price, add prices of pens desired.

KEUFFEL & ESSER CO. NEW YORK

LEROY LETTERING

REG. U. S. PAT. OFF.



LEROY LETTERING, as shown by the illustration above, requires three essential items namely:

Leroy Lettering Pen (see page 289).

Leroy Scriber (see page 290).

Leroy Template (see page 291).

Any of these items can be purchased separately, if desired; and a combination of practically any three of them can be employed for Leroy Lettering. They are also available in sets; each of which consists of an assortment of pens and templates for different sizes of lettering, together with a scriber, complete in a mahogany case (see page 292).

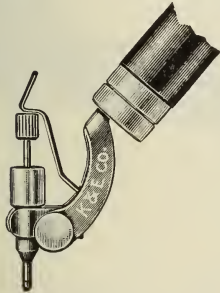
Since all parts of Leroy Lettering equipment are made of the finest materials, machined with the greatest precision, they not only operate with surprising ease and smoothness, but produce letters that are uniform in every respect.

The illustration above also plainly indicates that the lettering is always visible and above the template—an insurance against smearing; that no shifting is necessary to form any one character; that uniform letters are produced; and that the operation of forming a character is practically automatic.



LEROY LETTERING REG. U. S. PAT. OFF.

LEROY LETTERING PENS



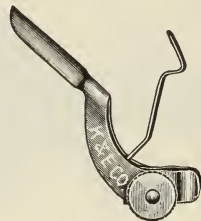
Pen, Socket Holder and Penholder complete for freehand lettering



Pen Complete



Cleaning Pin



Socket Holder for freehand lettering

Leroy Lettering Pens are manufactured with the precision of high grade watch parts; and are recommended as being the finest lettering pens made. They produce lines of uniform width, regardless of the direction in which they are moved when lettering. Their unique construction guarantees an absolutely even flow of ink.

When used with the socket-holder illustrated above, and a pen-holder, Leroy pens are excellent for making freehand letters, and are extensively used for that purpose.

14 Widths of Lines.



- 3231. Pocket Set**, containing 8 pens Nos. 3233-1 to-8N; and 2 socket holders No. 3234-1, in leatherette finish box. set
- No. 3231 can be furnished with any combination of pens, sizes 00 to 8N; at a small increase in price.
- 3233-00. Leroy Lettering Pen**, No. 00 each
- 3233-0. Leroy Lettering Pen**, No. 0 “
- 3233-1 to-8N. Leroy Lettering Pens**, Nos. 1, 2, 3, 4, 5, 6, 7N, 8N (specify number of pen). “
- 3233-9 to-14. Leroy Lettering Pens**, Nos. 9, 10, 12, 14 (specify number of pen). “
- 3233-00C and-0C. Cleaning Pins**, for Leroy Pens Nos. 3233-00 and-0 (specify number of pen). “
- 3233-1C to-14C. Cleaning Pins**, for Leroy Pens Nos. 3233-1 to-14 (specify number of pen). “
- 3233-F. Cleaning Fluid** for Leroy Pens, 1 oz. bottle
- 3234-1. Socket Holder** for Leroy Pens Nos. 3233-00 to-8N each
- 3234-2. Socket Holder** for Leroy Pens Nos. 3233 9 to-14. “
- 3235. Penholder** (see page 294). “

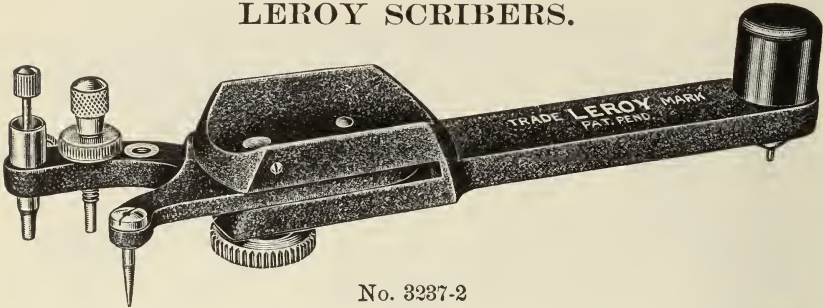
The “KECO” Ink, described on page 279, is an excellent ink for use with the Leroy Lettering Pens; the non-shatterable tube filler being the quickest and most efficient for filling these pens.



LEROY LETTERING.

REG. U. S. PAT. OFF

LEROY SCRIBERS.



No. 3237-2

Leroy Scribers are of two types — fixed and adjustable. The fixed scriber will produce vertical letters from vertical templates, and slanting letters from slanting templates. The adjustable scriber will produce either vertical or slanting letters from vertical lettering templates, and is recommended to all draftsmen who have occasion to frequently make both types of letters.

- 3237-1. Fixed Scriber, for use with Leroy Pens up to No. 3233-8N; and Leroy Templates (both vertical and slanting type) up to No. 3240-500C each LKH
- 3237-2. Adjustable Scriber, for use with Leroy Pens up to No. 3233-8N; and Leroy Templates (both vertical and slanting type) up to No. 3240-500C. In addition can be used with Leroy Templates No. 3240-700C to 3240-2000C for vertical lettering. CKH
- 3237-3. Fixed Scriber, for use with Leroy Pens Nos. 3233-9 to -14, and Leroy Templates Nos. 3240-700C to 3240-2000C " CKH
- N3238-1. Lead Holder to fit Leroy Scribers, Nos. 3237-1 and -2 for pencil lettering "
- N3238-5. Thin Line Stylus to fit Leroy Scribers, Nos. 3237-1 and -2 for lettering on stencil paper "
- N3238-6. Heavy Line Stylus to fit Leroy Scribers, Nos. 3237-1 and -2 for lettering on stencil paper "
No. N3238-1 to -6 are old Nos. 3236-1 to -6.
- 3239. Straightedge, maple 15 in. long, 1 in. wide, and $\frac{1}{8}$ in. thick, with two projecting needle points on the under face to hold the straightedge stationary on the drawing board. "
No. 3239 is old No. 3238.

LEROY TEMPLATES.



Leroy Templates are made of special laminated material, with engraved letters showing up sharply black on white. Each standard template contains the full alphabet in capitals and a set of numerals. Some of the templates, in addition, contain the full alphabet in lower case letters. The tracing grooves are actual characters, at once readable. Each character is formed complete without any shifting of the template. Since the pen is held rigidly in a vertical position, and since the scriber follows exactly the grooved characters, uniform letters are produced.



LEROY LETTERING.

REG. U. S. PAT. OFF.

LEROY TEMPLATES (continued)

WITH CAPITAL LETTERS AND NUMBERS.

3240-80C.	Template	9½ in., for vertical capitals and numbers	0.08 in. high. each
3240-100C.	"	9½ in., " " " " "	0.10 in. " "
3240-100CS.	"	9½ in., " slanting " " "	0.10 in. " "
3240-120C.	"	9½ in., " vertical " " "	0.12 in. " "
3240-120CS.	"	9½ in., " slanting " " "	0.12 in. " "
3240-140C.	"	9½ in., " vertical " " "	0.14 in. " "
3240-175C.	"	12 in., " " " " "	0.175 in. " "
3240-200C.	"	12 in., " " " " "	0.20 in. " "
3240-240C.	"	12 in., " " " " "	0.24 in. " "
3240-290C.	"	12 in., " " " " "	0.29 in. " "
3240-350C.	"	15 in., " " " " "	0.35 in. " "
3240-425C.	"	15 in., " " " " "	0.425 in. " "
3240-500C.	"	15 in., " " " " "	0.50 in. " "
3240-700C.	"	18 in., " " " " "	0.70 in. " "
3240-1000C.	"	18 in., " " " " "	1.00 in. " "
3240-1350C.	"	24 in., " " " " "	1.35 in. " "
3240-2000C	"	24 in., " " " " "	2.00 in. " "

WITH CAPITAL AND LOWER CASE LETTERS, AND NUMBERS.

3240-100CL.	Template	9½ in., for vertical capitals, lower case and numbers	0.10 in. high. each
3240-120CL.	"	9½ in., " " " " "	0.12 in. " "
3240-120CLS.	"	9½ in., " slanting " " "	0.12 in. " "
3240-140CL.	"	9½ in., " vertical " " "	0.14 in. " "
3240-175CL.	"	12 in., " " " " "	0.175 in. " "
3240-175CLS.	"	12 in., " slanting " " "	0.175 in. " "
3240-200CL.	"	12 in., " vertical " " "	0.20 in. " "
3240-240CL.	"	12 in., " " " " "	0.24 in. " "

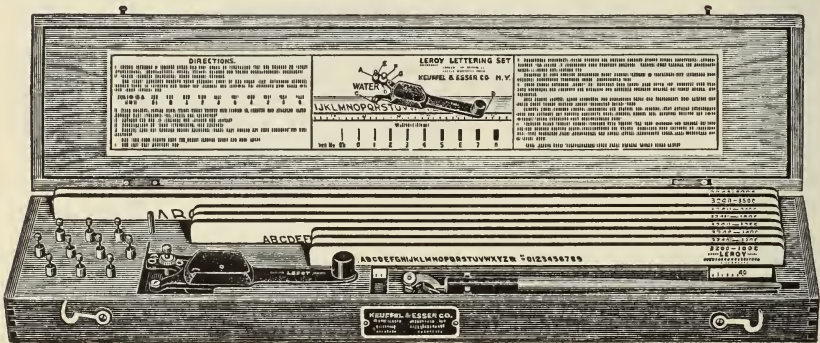
3240X. Single Template, of any standard size (up to 15 in.) and style of character used in the regular templates, including up to 25 characters not to exceed 0.5 in. in height each

Each additional character on special single template extra

Special Designs on Leroy Template blanks can also be furnished. Any standard phrase or small pattern, as used on drawings or signs, can be made.



LEROY LETTERING REG. U. S. PAT. OFF. **COMPLETE SETS.**



Leroy Lettering Set No. N3245-12.

- N3245-6.** Leroy Lettering Set, consisting of 6 Leroy Templates Nos. 3240-100C, -120C, -140C, -175C, -200C, -240C; 6 Leroy Pens Nos. 3233-00, -0, -1, -2, -3, -4; 1 Lead Holder, No. N3238-1; 1 Adjustable Scriber No. 3237-2; 1 Socket Holder No. 3234-1; and 1 Penholder No. 3235; in polished mahogany case $13\frac{3}{4} \times 3\frac{3}{8} \times 1\frac{3}{4}$ in. over all..... set
- N3245-10.** Leroy Lettering Set, consisting of 5 Leroy Templates Nos. 3240-140C, -175C, -240C, -350C, -500C; 5 Leroy Pens Nos. 3233-1, -2, -3, -4, -6; 1 Lead Holder No. N3238-1; 1 Adjustable Scriber No. 3237-2; 1 Socket Holder No. 3234-1; and 1 Penholder No. 3235, in polished mahogany case $16\frac{1}{4} \times 2\frac{7}{8} \times 1\frac{3}{8}$ in. over all. set
- N3245-12.** Leroy Lettering Set, consisting of 8 Leroy Templates Nos. 3240-100C, -120C, -140C, -175C, -200C, -240C, -350C, -500C; 10 Leroy Pens Nos. 3233-00, -0, -1 to -8N; 1 Lead Holder No. N3238-1; 1 Adjustable Scriber No. 3237-2; 1 Socket Holder No. 3234-1; and 1 Penholder No. 3235; in polished mahogany case $16\frac{1}{4} \times 3\frac{3}{4} \times 1\frac{3}{8}$ in. over all. . . set
- N3245-15.** Leroy Lettering Set, consisting of 11 Leroy Templates Nos. 3240-80C, -100C, -120C, -140C, -175C, -200C, -240C, -290C, -350C, -425C, -500C; 10 Leroy Pens No. 3233-00, -0, -1 to -8N; 1 Lead Holder No. N3238-1; 1 Adjustable Scriber No. 3237-2; 1 Socket Holder No. 3234-1; and 1 Penholder No. 3235; in polished mahogany case, $16\frac{1}{4} \times 4\frac{1}{8} \times 1\frac{3}{8}$ in. over all. set

PLAIN MAHOGANY CASES

- 3246-4.** Plain Mahogany Case, $15 \times 1\frac{7}{8} \times 1\frac{1}{2}$ in. over all, to accommodate any 8 assorted $9\frac{1}{2}$ in. Leroy Templates, 4 Leroy Pens, and Scriber. case only
- 3246-10.** Plain Mahogany Case, $16 \times 3\frac{1}{4} \times 1\frac{1}{2}$ in. over all, to accommodate any 8 assorted 12 in. and 15 in. Templates; any 8 assorted $9\frac{1}{2}$ in. Templates; 10 Leroy Pens, and Scriber..... case only
- 3246-20.** Plain Mahogany Case, $27\frac{1}{4} \times 4 \times 1\frac{1}{2}$ in. over all, to accommodate any 8 assorted 18 in. and 24 in. Templates; any 8 assorted $9\frac{1}{2}$, 12 and 15 in. Templates; 10 Leroy Pens, size No. 3233-8N and smaller; 6 Leroy Pens, size No. 3233-9 and larger; Leroy Scriber No. 3237-1 or No 3237-2; and Leroy Scriber No. 3237-3..... case only

Cases Nos. 3246-4, -10, and -20, plain finish, do not have a separate space for each template, as in the highgrade polished cases of sets Nos. N3245-6, -10, -12 and -15.



ACTUAL SIZE SAMPLES OF LEROY LETTERING

LEROY LETTERS ARE AVAILABLE FROM .08 INCH TO 2 INCHES IN HEIGHT

PEN NO.

00 VERTICAL LETTERING OF THIS 80

TEMPLATE 80C.

Fixed or Adjustable Scriber.

THE SAME TEMPLATES WHICH AR

80C.

Adjustable Scriber.

00 KIND IS MADE 100

TEMPLATE 100C, 100CL.

Fixed or Adjustable Scriber.

lettering made from

100CL.

USED FOR VERTIC

100C, 100CL.

Adjustable Scriber.

0 WITH THE FI 120

TEMPLATE 120C, 120CL.

Fixed or Adjustable Scriber.

leroy template is

120CL.

LETTERING WIL

120C, 120CL.

Adjustable Scriber.

1 SCRIBER 140

TEMPLATE 140C, 140CL.

Fixed or Adjustable Scriber.

unequalled for

140CL.

BY MEANS OF

140C, 140CL.

Adjustable Scriber.

2 OR THE 175

TEMPLATE 175C, 175CL.

Fixed or Adjustable Scriber.

neatness

175CL.

THE ADJUS

175C, 175CL.

Adjustable Scriber.

3 ADJUS 20 accuracy

TEMPLATE 200C, 200CL.

Fixed or Adjustable Scriber.

SCRIBER

200C, 200CL.

Adjustable Scriber.

3 WHE 24

TEMPLATE 240C, 240CL.

Fixed or Adjustable Scriber.

speed

240CL.

WHENO

240C, 240CL.

Adjustable Scriber.

4 CLOSE 29

TEMPLATE 290C.

Fixed or Adjustable Scriber.

REPRODU

290C.

Adjustable Scriber.

4 CHAR 35

TEMPLATE 350C,

Fixed or Adjustable Scriber.

SLANTI

350C.

Adjustable Scriber.

5 ARE 42

TEMPLATE 425C.

Fixed or Adjustable Scriber.

EASY A

425C.

Adjustable Scriber.

6 LERO

TEMPLATE 500C.

Fixed or Adjustable Scriber.

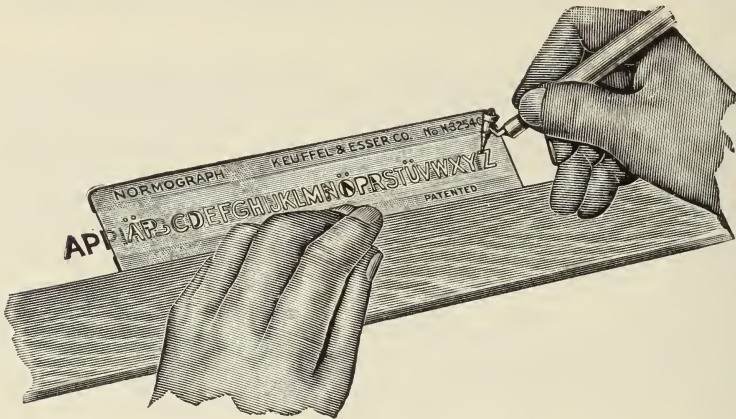
NEAT

500C.

Adjustable Scriber.



THE NORMOGRAPH.



The Normograph is a rapid lettering device, which is comparatively low in price. The above illustration indicates its nature, and the method of operation.

TEMPLATES.

Vertical Capitals	Vertical Lower Case and Numerals	Vertical Lower Case	Vertical Numerals	Height of Capital Letter	Use Pen No. 3294-
N3250C	N3250LN	.....	.....	0.140 in.	0
N3251C	N3251LN	.....	.....	0.160 in.	1
N3253C	N3253LN	.....	.....	0.200 in.	2
N3254C	N3254LN	.....	.....	0.275 in.	4
N3256C	.....	.....	N3256N	0.400 in.	5
N3258C	.....	N3258L	N3258N	0.475 in.	6
N3260C	.....	N3260L	N3260N	0.630 in.	7
Slanting Capitals	Slanting Lower Case and Numerals	Slanting Lower Case			
N3261C	N3261LN	.....	.....	0.160 in.	1
N3263C	.....	.....	.....	0.200 in.	2
N3264C	.....	.....	.....	0.275 in.	4
N3266C	.....	N3266L	.....	0.400 in.	5

3270. Wooden Box, $17\frac{5}{8} \times 6\frac{1}{2} \times 2\frac{1}{4}$ in., to hold complete assortment of Normograph Templates and Pens.....box only

PENS AND PEN HOLDER.



No. 3294-4 with No. 3297.

PEN No. 3294-0 3294-1 3294-2 3294-4 3294-5 3294-6 3294-7 each
 3235. Pen Holder..... each



THE NORMOGRAPH

FULL SIZE EXAMPLES OF LETTERING AND THICKNESS OF LINES
OBTAINED WITH THE NORMOGRAPH AND APPROPRIATE PENS.

The lower case letters are placed opposite the corresponding capitals.

ABCDEFGHIJKL

No. N 3250 C
Pen No. 3294-0

mnopqrstuvw

No. N 3250 LN
Pen No. 3294-0

ABC DEF

No. N 3251 C No. N 3261 C
Pen No. 3294-1

klmno *pqrstu*

No. N 3251 LN No. N 3261 LN
Pen No. 3294-1

ABC FGH

No. N 3253 C No. N 3263 C
Pen No. 3294-2

ijklmnopqr

No. N 3253-LN
Pen No. 3294-2

AB CD

No. N 3254 C No. N 3264 C
Pen No. 3294-4

efghijklm

No. N 3254 LN
Pen No. 3294-4

AB CD

No. N 3256 C No. N 3266 C
Pen No. 3294-5

12 *efg*

No. N 3256 N No. N 3266 L
Pen No. 3294-5

AB 6

No. N 3258 C No. N 3258 N
Pen No. 3294-6

cdefg

No. N 3258 L
Pen No. 3294-6

AB 8

No. N 3260 C No. N 3260 N
Pen No. 3294-7

cdef

No. N 3260 L
Pen No. 3294-7

The letters following the Catalogue Number of a template, have the following significance: C=capitals only; L=lower case; N=numerals; LN=lower case and numerals.

Note: An outfit consists of at least one Template and one Pen.



LEAD PENCILS.

PARAGON PENCILS. REG. U. S. PAT. OFF.



Paragon Pencils are of good quality and of uniform grading.

3300. Paragon Pencils, extra fine quality, hexagon, yellow polish and gilt: 2B, B, HB, F, H, HH, 3H, 4H, 5H, 6H. each

PENCIL HOLDERS.



No. 3349.

3349. Holder for pencil stumps, $4\frac{1}{2}$ in., hexagonal, metal ferrule. . each

ELDORADO PENCILS.



No. 3352.

3352. Eldorado Drawing Pencils, yellow polish, hexagon, gilt, Nos. 6B, 5B, 4B, 3B, BB, B, HB, F, H, HH, 3H, 4H, 5H, 6H, 7H, 8H, 9H each

VENUS PENCILS.



No. 3356.

3356. Venus Drawing Pencils, crackled green finish, edgeless, Nos. 6B, 5B, 4B, 3B, 2B, B, HB, F, H, 2H, 3H, 4H, 5H, 6H, 7H, 8H, 9H each

VAN DYKE MICROTOMIC PENCILS.



No. 3370.

3370. Van Dyke Microtomic Pencils, hexagon, yellow polish, 7 B, 6 B, 5 B, 4 B, 3 B, BB, B, HB, F, H, HH, 3 H, 4 H, 5 H, 6 H, 7 H, 8 H, 9 H, each



LEAD PENCILS.

MARS LUMOGRAPH PENCILS.



No. 3376.

Due to the opaqueness of the lines produced by **MARS LUMOGRAPH** pencils, they are particularly suitable for drawings on tracing papers and tracing cloths which are to be reproduced by photo-printing.

- 3376. Mars Lumograph Pencils**, hexagon, blue polish, Ex Ex B,
Ex B, 3 B, 2 B, B, HB, F, H, 2 H, 3 H, 4 H, 6 H. . each

CASTELL PENCILS.



No. 3378.

- 3378. Castell Pencils**, hexagon, very best, green polish,
6 B, 5 B, 4 B, 3 B, BB, B, HB, F, H, HH, 3 H,
4 H, 5 H, 6 H, 7 H, 8 H, each

KOH-I-NOOR PENCILS.



No. 3080.

- 3380. Koh-i-noor Pencils**, hexagon, yellow polish, 6 B, 5 B, 4 B,
3 B, BB, B, HB, F, H, HH, 3 H, 4 H, 5 H, 6 H, 7 H,
8 H, 9 H each

- 3381. Koh-i-noor Copying Pencils** “



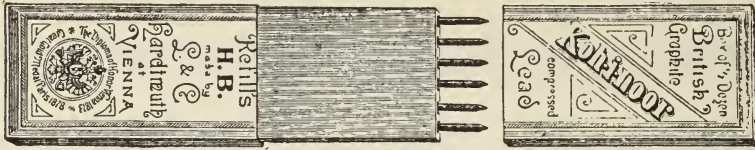
No. 3383.

- 3383. Koh-i-noor Artist Pencil**, yellow polish, 6 B, 5 B, 4 B, 3 B,
BB, B, HB, F, H, HH, 3 H, 4 H, 5 H, 6 H, 7 H,
8 H, 9 H each



LEAD PENCILS.

KOH-I-NOOR LEADS.



No. 3385.

- 3385. Koh-i-noor Leads for Artist Pencils, 6 B, 5 B, 4 B, 3 B, BB, B, HB, F, H, HH, 3 H, 4 H, 5 H, 6 H, 7 H, 8 H, 9 H per box of 6**

MEPHISTO COPYING PENCILS.

- 3390. Mephisto Copying Pencils, (No. 73 B) each**
3391. do. do. do. (No. 73 B hard) "
3392. do. do. do. with red tip (No. 77) "

COLORED PENCILS.



No. 3393.

- 3393. Eberhard Faber's Mongol Colored Indelible Pencils each**

No. 849. Black	No. 868. Green, dark	No. 862. Orange
" 865. Blue, dark	" 898. " , French	" 846. Pink
" 845. " light	" 848. " , Light	" 844. Purple
" 855. " Prussian	" 888. " , Olive	" 866. Red
" 863. Brown	" 858. " , Prussian	" 813. Terra Cotta
" 893. " , Vandyke	" 819. Grey	" 841. White
" 876. Carmine	" 864. Heliotrope	" 867. Yellow
" 808. " , Burnt	" 853. Ochre, Brown	" 817. Lemon

- 3394. Box with snap fastener, containing one dozen Mongol Indelible Pencils, including Black, Light Blue, Dark Blue, Brown, Carmine, Light Green, Dark Green, Heliotrope, Orange, Purple, Red and Yellow; with directions for use. per box**



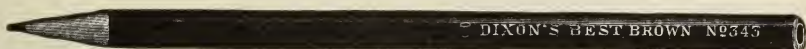
No. 3395.

- 3395. A. W. Faber's Polychromos Pencils each**

No. 1. White	No. 38. Pale vermilion	No. 17. Hooker's green No. 2
" 4. Light chrome	" 29. Red violet lake	" 32. Madder Carmine
" 24. Ultramarine	" 9. Orange	" 21. Light blue
" 49. Indian red	" 14. Green bice	" 60. Ivory black



COLORED PENCILS.



3397. Dixon's Colored Pencils, each

- | | |
|---------------------|-----------------------|
| No. 352. White, | No. 351. Terra Cotta, |
| " 322. Pink, | " 343. Brown, |
| " 321½. Lake red, | " 331. Black, |
| " 349. Red, | " 353. Golden yellow, |
| " 324. Orange, | " 354. Green, |
| " 325. Olive green, | " 320. Sky blue, |
| " 350. Blue, | " 330. Indigo blue. |

3398. Dixon's Colored Pencils, in boxes,
box of 12, assorted colors. per box

3399. Dixon's Thinex Colored Pencils each

- | | |
|---------------|-----------------|
| No. 370. Red | No. 373. Yellow |
| " 390W. White | " 376. Blue |



No. 3400.

3400. Van Dyke Blueprint Pencils, each

- | | |
|----------------|---------------|
| No. 651. White | No. 656. Red |
| " 655. Blue | " 657. Yellow |



No. 3401 G.

3401G. Stabilo gold color lead pencil for marking blueprints each

3401S. Stabilo silver " " " " " " "

LUMBER CRAYONS.

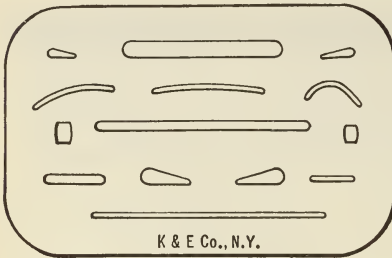


No. 3405.

- 3404.** FAVORITE Lumber Crayons, $4\frac{3}{4} \times \frac{1}{2}$ in., paper covered,
Black, Blue, Red and Yellow doz.
- 3405.** Dixon's Lumber Crayons, $4\frac{1}{2} \times \frac{1}{2}$ in., paper covered,
Carbon Black, Yellow, Red, Blue, Green doz.



ERASING SHIELDS.



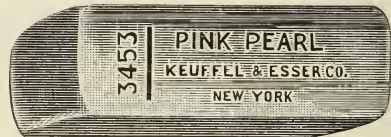
No. 3411 is carefully made of the highest grade of Swedish bright tempered spring steel, whose extreme hardness resists the wear caused by erasing, and which springs back to its flat form after having been considerably bent. This implement should not be confused with the cheap shields of soft steel, which soon wear, kink and bend.

- | | | | |
|-------|---|--|------|
| 3410. | Nickel Silver Erasing Shield for Draftsmen, | $2\frac{3}{8} \times 3\frac{3}{4}$ in. | each |
| 3411. | Steel do. do. do. | $2\frac{3}{8} \times 3\frac{3}{4}$ " | " |
| 3412. | Xylonite do. frosted | $2\frac{3}{8} \times 3\frac{3}{4}$ " | " |

RUBBER ERASERS.



No. 3452



No. 3453.

- | | | | |
|----------|--|---|------|
| 3452-40. | Pliable Rubber, gray, flat, 40 to lb., | $1\frac{3}{8} \times 1 \times \frac{3}{8}$ in. | each |
| -24. | " " " " 24 " " | $1\frac{3}{8} \times 1\frac{1}{8} \times \frac{1}{2}$ " | " |
| -20. | " " " " 20 " " | $1\frac{3}{8} \times 1\frac{1}{4} \times \frac{1}{2}$ " | " |
| -12. | " " " " 12 " " | $2 \times 1\frac{3}{8} \times \frac{5}{8}$ " | " |
3453. Pink Pearl Eraser, large, oblong, wedge edge, $2\frac{1}{2} \times 1\frac{3}{16} \times \frac{7}{16}$ in. . . each



No. 3455 R.

- | | | | |
|-----------|--|--|------|
| 3455R-48. | Red Rubber, oblong, wedge edge, 48 to lb., | $2\frac{7}{8} \times \frac{7}{16} \times \frac{3}{8}$ in., | each |
| -36. | " " " " " 36 " " | $2\frac{7}{8} \times \frac{1}{2} \times \frac{3}{8}$ " | " |
| -24. | " " " " " 24 " " | $3\frac{1}{8} \times \frac{5}{8} \times \frac{3}{8}$ " | " |



RUBBER ERASERS



No. 3456G-2.

- 3456G-1. Green Rubber, medium, both ends wedge shape, $2\frac{1}{2} \times \frac{5}{8} \times \frac{5}{16}$ in., each
 3456G-2. do. do. large " " " " , $3\frac{1}{2} \times \frac{1}{16} \times \frac{3}{8}$ " "
 3456R-1. Red Rubber, medium, " " " " , $2\frac{1}{2} \times \frac{5}{8} \times \frac{5}{16}$ " "
 3456R-2. do. do. large " " " " , $3\frac{1}{2} \times \frac{1}{16} \times \frac{3}{8}$ " "



No. 3457.

3457. VAN DYKE Soft Ink Eraser, $2\frac{3}{4} \times \frac{1}{16} \times \frac{3}{8}$ in. each



No. 3458-1.

- 3458-1. Ink and Pencil Eraser, medium, $2\frac{5}{8} \times \frac{5}{8} \times \frac{5}{16}$ in. each



No. 3459-1.

Rub Kleen cleans paper, drawing boards, cloth, leather, wood and fabrics without messy crumbling and without leaving a greasy film. It is quick, effective, and economical; and will not weaken even newly inked lines.

- 3459-1. Rub Kleen Eraser, small, $2 \times 1 \times \frac{3}{4}$ in. each
 3459-2. Rub Kleen Eraser, large, $3 \times 1\frac{1}{2} \times \frac{3}{4}$ in. "



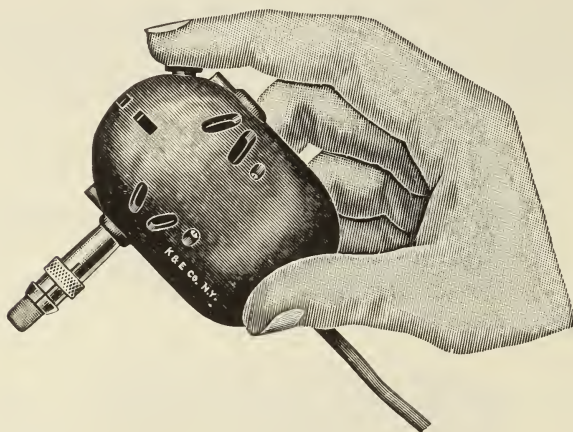
No. 3460C.

- 3460A. Art Gum, $1\frac{1}{8} \times 1\frac{1}{8} \times 1\frac{1}{8}$ in. each
 3460B. " " $2 \times 1 \times 1$ " "
 3460C. " " $2\frac{1}{4} \times 1\frac{1}{8} \times 1\frac{1}{8}$ " "
 3460D. " " $3 \times 2 \times 1$ " "
 3460E. " " $3 \times 3 \times 2$ " "

KEUFFEL & ESSER CO., NEW YORK

PAWK MOTORASER

TRADE MARK

ELECTRIC ERASING MACHINE.

This small electric erasing machine cleans large areas rapidly and with no appreciable effort. It reduces erasing time to seconds, and physical effort to nothing at all. Speed, not pressure, makes the erasure; an insurance in itself that holes will not be worn in the drawing. The control switch is directly under the finger tip.

Pawk Motoraser is a rugged mechanism, housed in a minimum of space. It weighs only six ounces, and fits the palm of the hand. The housing, of moulded composition, is only 3 inches long, by 2½ inches in diameter. It has no corners or sharp edges. The high speed erasing point can be directed as accurately as a pencil point.

This erasing machine is built for long and economical service. The housing will not dent; nor will its finish crack or chip off. The eraser chuck is turned from solid stock, and will hold its alignment permanently. Added to its low first cost is its cheapness of operation and maintenance, since it consumes very little current, and the replacement erasers are inexpensive.

The machine is furnished complete with 6 ft. of dustproof rubber-covered cord, a plug, and a dozen erasers. Separate models are furnished for AC and DC current.

- 3475 A. PAWK Motoraser, for 110 volts AC, complete with 6 ft.
electric cord, plug and one dozen erasers each
- 3475 D. PAWK Motoraser, complete as described under No. 3475 A,
but for 110 volts DC each
- 3475-10. Erasers for all around use, as supplied regularly with
Nos. 3475 A and D per gross
- 3475-11. Erasers of harder rubber than No. 3475-10, especially
suitable for ink erasures..... per gross



STEEL ERASERS.



No. 3480.

3480. Steel Eraser with long blade, Bone Handle, each
 3481. do. " " " Coco " "



No. 3486.

3485. Steel Eraser with short blade, Bone Handle, each
 3486. do. " " " Coco " "

LEAD PENCIL FILE.

A convenient little tool, consisting of a steel file with a steel tack lifter at the end; black wooden handle.

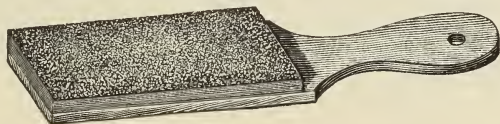


No. 3488.

3488. Lead Pencil File and Tack Lifter, 6 in. each

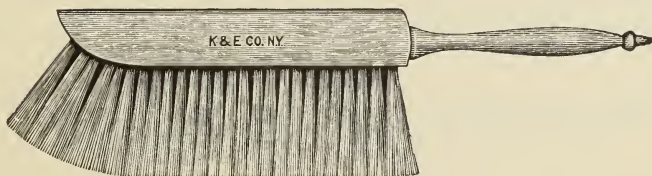
PENCIL POINTERS.

These Pencil Pointers consist of 12 sheets of abrasive paper made into a block.



3507. Pencil Pointer, Flint Paper, with wooden handle, Block 1×3½ in. each
 N3508. Pencil Pointer, similar to No. 3507, but black abrasive paper. "

DUSTING BRUSHES.

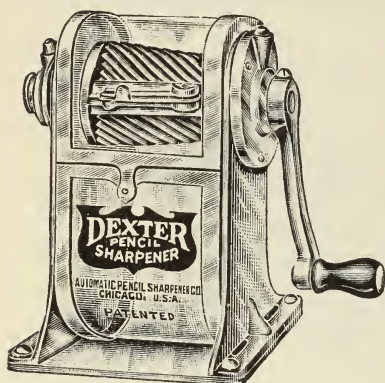


No. 3510.

3510. Dusting Brush, 2½ in. white bristle, staple set in hardwood, 13 inches long, 5 in. handle. Finest quality flat beveled style, which lies flat and which stows away readily in a drawer or pigeon hole. each
 3511. Dusting Brush, 2 in. bristles, staple set in hardwood, 14½ in. long, 6 in. handle. "

KEUFFEL & ESSER CO., NEW YORK

PENCIL SHARPENERS.



No. 3518.



Showing lead exposed when
No. 3518 is used.

The Dexter is the most satisfactory hand feed pencil sharpener that can be produced. The twin milling cutters are made of the best tool steel; a guarantee of long service.

The transparent shaving receptacle adjusts itself to any position. Consequently the sharpener can be suspended from above, placed on the wall, or fastened to desk or table. These machines are of the highest grade workmanship and are beautifully finished.

N3517. Dexter Pencil Sharpener, steel frame, enameled in green each

No. N3517 sharpens all sizes of pencils, and has a point adjuster which enables the user to produce any desired point from blunt to fine. When the pencil is thoroughly sharpened the cutters no longer function, which feature necessarily makes for considerable saving in pencil expense.

3518. Dexter Pencil Sharpener, steel frame heavily nickelplated and highly polished, fitted with draftsman's special cutters . . . each

These cutters of No. 3518 take off the wood only, leaving the lead exposed. The lead may be pointed on a file or sandpaper to suit requirements.



Round Writing PENS.

F. SOENNECKEN'S system of ornamental writing, called Round Writing, hardly needs any recommendation on our part. There is scarcely any profession or business but could advantageously make use of this writing in many ways.



No. 3530.



No. 3534.



No. 3532.

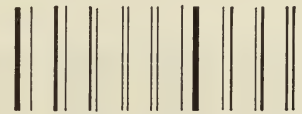


No. 3535.

Width of Lines.



3530



3532



3534

3520. **Methodical Text-Book to Round Writing** by F. SOENNECKEN,
(published by KEUFFEL & ESSER Co., New York) including
an assortment of 25 single and double-pointed pens. each
3521. do. do. do. Book without pens “
3530. **Single Pointed Pens**, Nos. 1A, 1B, 1, 1½, 2, 2½, 3, 3½, 4, 4½,
5, 5½, 6, any one number per gross
3531. do. do. do. do. do. “ ¼ “
3532. **Double Pointed Pens**, Nos. 10, 20, 30, 40, 50, 60, 70, 80, 90,
any one number “ ¼ “
“ doz.
- Pens Nos. 40 and 50 have two fine equal points, and are used
as road pens in map drawing.
3533. **Sample Assortment** of Single and Double-Pointed Pens,
with Inkholder, 25 in a box per box
3534. **Three-Pointed Pen** for ornamental work, each
3535. **Inkholder** for single-pointed Pens, especially adapted for
writing with India or Autograph Ink, per box of 6 “



SOENNECKEN LETTERING AND SIGN-WRITING PENS

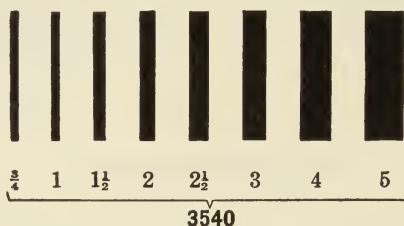


No. 3540



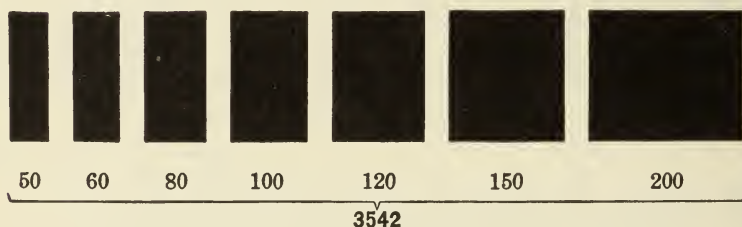
No. 3542

Width of lines



3540 Lettering Pens, Nos. $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, 4, 5, any one number, $\frac{1}{4}$ gross doz.

Width of lines

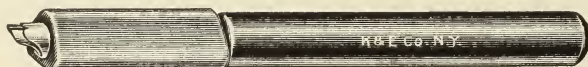


3542 Sign-Writing Pens, Nos. 50, 60, 80, 100, 120, 150, 200, any one number, doz.

PENHOLDERS.



3560. Penholder for Soennecken Round Writing and Lettering Pens, . . . each



3562. Penholder for Soennecken Round Writing and Lettering Pens, with improved rubber grip of triangular cross-section . . . each

The rubber grip, having flattened sides, offers a firm and easy hold; and likewise prevents the penholder from rolling when laid down.

K & E

SLIDE RULES





K & E

REG. U. S. PAT. OFF.

SLIDE RULES.

The **Slide Rule** is an instrument for performing various arithmetical, algebraical and trigonometrical calculations by mechanical means. The theory of the rule is simple and easily learned and but little practice is necessary to attain proficiency in its use.

As a time saver the Slide Rule is unequalled, and for all practical purposes it gives results with a degree of accuracy and rapidity that soon make its use indispensable to the Engineer, Scientist, Merchant or Student. Calculations of the type $\frac{16.7 \times 4.98 \times 7.61}{2.35 \times 3.19}$ can be solved as quickly and readily as $\frac{2 \times 4 \times 6}{3 \times 7}$, and either problem can be solved in a fraction of the time required by the usual arithmetical processes.

The first Slide Rules to be put to practical use, were of the type No. N4041, page 311. This type is known as the **Mannheim Slide Rule**. The upper face of this rule carries two single (C and D) and two double logarithmic scales (A and B) and a runner or indicator for finding coinciding points on the scales. On the under face of the slide are scales of Sines, Tangents and equal parts. The back of the rule carries a table of settings and ratios.

The first radical departure from this type of Slide Rule is shown in the K & E **DUPLEX* Slide Rule** (see **POLYPHASE DUPLEX*** Slide Rules, pages 314 and 315). In this Slide Rule, the bodies of the rule and the slide are of the same thickness and flush on both sides, thus allowing for the addition of a number of extra scales and giving the Slide Rule a much wider field of use.

K & E Slide Rules are made of the finest obtainable materials, and an entire department of our large factory is devoted exclusively to their manufacture. Numerous features are patented and are not found in other rules.

* REG. U. S. PAT. OFF.

KEUFFEL & ESSER CO. NEW YORK

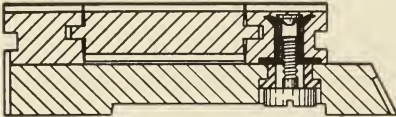
K & E SLIDE RULES.

REG. U. S. PAT. OFF.

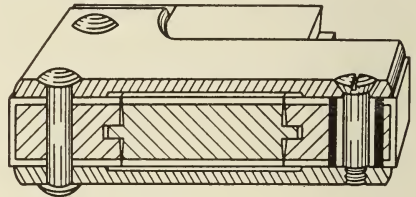
K & E SLIDE ADJUSTMENT.

It is well known that the materials of which most slide rules are made (wood, xylonite or celluloid) are affected by atmospheric changes. Under ordinary conditions these changes have no effect upon K & E slide rules; in which the liability of shrinking and swelling has become a nearly negligible factor, due to the use of the most approved processes in the seasoning treatments of the materials employed. Under extreme conditions, however, shrinkage or swelling may become so marked as to interfere with the smoothness of operation of the slide. Consequently, some means is required to readjust the rule.

Before the K & E slide rule adjustment was devised, various means had been adopted to take care of appreciable shrinkage and swelling; but each of these had some serious drawback. None of the so-called "automatic" adjustments, for instance, has proved practicable in use. Those in which the base or stock, cut lengthwise into halves, is held together by springs, soon become useless through uneven shrinkage, and do not afford a rigid bed for the slide; while those which depend upon springs to hold one edge of the slide against the rule, become objectionable because of the gap which appears between the rule and the opposite edge of the slide.



Mannheim Rules.



DUPLEX* Rules.

Cross section of K & E Slide Rules showing Slide Adjustment.

The **K & E Slide Adjustment**, by successfully overcoming these drawbacks, has solved the problem perfectly. In the Mannheim type rules, one of the grooved guide pieces (in which the slide moves) is in a separate piece from the body of the rule, to which it is secured by means of set screws. These setscrews pass through oblong slots in the body of the rule into threaded metal bushings in the adjustable guide piece. This construction, while insuring that the guide piece will be held rigidly in place when the screws are tight, permits it to be moved away from or toward the slide when the screws are loosened. Hence, should adjustment become desirable, it is only necessary to loosen the screws, bring the guide piece against the slide according to the friction desired, and tighten the screws again.

In the **DUPLEX*** slide rule, the nickel silver end pieces, which join the two side bars of the stock, are provided with set screws which pass through oblong slots in one of the side bars. Adjustment is made by releasing the setscrew at each end of the bar, shifting the bar toward or away from the slide to give the desired friction, and then tightening the screws.

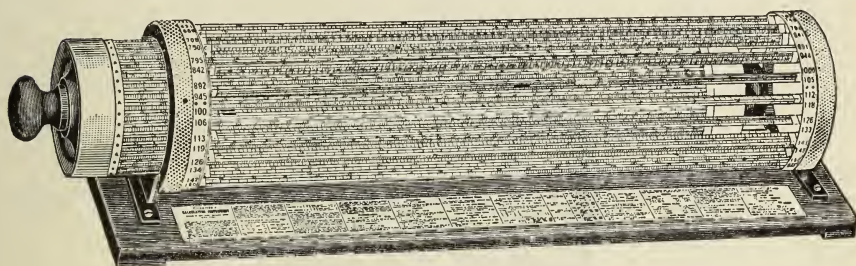
NUMBERING OF SLIDE RULES.

Great care has been taken to make the numbering of the graduations as distinct and permanent as possible. Since *sub-numbers* are not required by the adept, and tend to confuse and hinder beginners, we do not regularly number the sub-divisions throughout.

* REG. U. S. PAT. OFF.



THACHER'S CALCULATING INSTRUMENT.



No. N 4012.

- | | | |
|----------------|---|------|
| N 4012. | Thacher's Calculating Instrument, cylinder 18 in.; in polished mahogany Box, with full Directions | each |
| N 4013. | do. do. do. with 3-in. reading glass sliding on brass bar, adjustable to any part of the instrument and for focus | “ |
| | Extra copy of directions | “ |

Thacher's Calculating Instrument is a device for performing a great variety of useful arithmetical calculations with rapidity and accuracy. Its operation is simple and is readily learned. By its use the tedious drudgery of calculation is avoided and the chance of error eliminated.

As is shown in the illustration, the instrument consists of a cylinder 4 in. in diam. and 18 in. long, which revolves in an open framework composed of 20 angular bars held between two metal rings. The cylinder bears a scale corresponding to the scale of the Slide Rule, which is duplicated on the exposed sides of the bars. Results can be obtained to the fourth, and often to the fifth place of figures, and are correct to about one part in 10,000 (.01 of 1 per cent), which is sufficient for nearly every requirement of the professional or business man. Examples in multiplication, division, proportion and powers or roots involving not more than three quantities, are solved by one operation and any number of values of an algebraic function composed of two constants and a single variable may generally be found by one setting.

The useful applications of the instrument are almost unlimited; among them may be mentioned; finding the stresses and sections in trusses and girders, mensuration, estimates of work and material, solving trigonometrical formulæ, making and applying tables, problems in mechanical powers, machinery and hydraulics, problems in simple and compound interest, discount, prorating, the conversion of weights and measures, cost of merchandise with per cent. of duty or profit added.

For example, any of the formulæ

$$\frac{ax}{b} \quad , \quad \frac{ax^2}{b} \quad , \quad \frac{ax}{b^2} \quad , \quad \frac{ax^2}{b^2} \quad , \quad \sqrt{\frac{ax}{b}} \quad , \quad \sqrt{\frac{a^2x}{b}}$$

in which a and b may have any values and x any number of values, are readily solved by one setting. Squares, square roots, cube roots and reciprocals are also readily worked.

The following are a few problems which may be readily solved by the use of Thacher's Calculating Instrument:

A 15-in. "I" beam, resting upon supports 14.5 ft. apart sustains a load of 17500 lbs. at the center. What weight of beam is required if $S=10000$ lbs. per sq. in.? (This problem is solved in three settings of the instrument.)

\$541.36 are to be divided prorata among various accounts amounting to \$7436.00. Required, the amount, going to account of \$427.50, \$763.80, etc. (The several amounts are each found in one setting.)

A train weighing 2500 lbs. per lineal foot passes over a bridge on a 4° curve at a speed of 30 miles an hour; required, its effect upon the lateral system. (This problem is solved in one setting.)

What will be the amount of \$250.00 placed at compound interest for 10 years at 6%? (This problem is solved in one setting.)

KEUFFEL & ESSER CO., NEW YORK

POCKET CALCULATORS.



No. 4017.

\$27.50

- 4017. Sperry's Pocket Calculator**, watch pattern $2\frac{1}{2}$ in. diam., two glass covered, engraved, metal dials, with Directions. each

Sperry's Pocket Calculator, represents a new departure in pocket calculators, as by its construction the length of the logarithmic scale is increased from about $6\frac{1}{2}$ in. (in other calculators) to an actual length of about $12\frac{1}{2}$ inches, which allows of reading results somewhat closer than on the C-D scales of 10 in. straight slide rule. The instrument has the form of a watch, with an engraved, glass covered metal dial on each side. Each dial has an index hand and a stationary pointer, which together take the place of the indicator (runner) of a straight slide rule. There is a small ring on the case for attaching the instrument to the watch chain. The two dials are revolved together by a milled thumbnut which is concentric with the knob which revolves the two indexes (hands) together.

The S dial bears a scale of equal parts, a circular logarithmic scale, and a scale of square roots. It corresponds to the two outer scales and the scale of equal parts of the straight slide rule. The L dial bears a logarithmic scale arranged in three spiral rings beginning and ending on the same radial dial line.

Sperry's Pocket Calculator, being made of metal, is but slightly affected by atmospheric changes. The scales are circular and are, therefore, practically endless, each "re-set" multiplying or dividing the value of the reading without loss of time or interruption. The result never lies beyond the end of the scales as it sometimes does in the straight slide rules of the Mannheim type.

KEUFFEL & ESSER CO., NEW YORK

MANNHEIM SLIDE RULES.

5-INCH RULE.

- 4031S.** K & E Adjustable (Mannheim) Slide Rule, 5-in., engine divided, divisions on white facings, with "Frameless" Glass Indicator; in sewed Leather Case, with Directions each 600

The 5 inch rule has from 10 to 50 subdivisions between the prime numbers, whereas the ordinary 10 inch rule has from 20 to 100.

8-INCH RULE.

- N4035S.** K & E Adjustable (Mannheim) Slide Rule, 8-in., engine divided, divisions on white facings, with improved Glass Indicator; in sewed Leather Case, with Directions "

The 8 inch rule is as closely divided as the ordinary 10 inch rule, except on the scale of equal parts, and the lower range of the sine scale.

10-INCH RULE.

- N4041.** K & E Adjustable (Mannheim) Slide Rule, 10-in., engine divided, divisions on white facings, with improved Glass Indicator; in Case, with Directions "

- N4041S.** Same as No. N4041 but in sewed Leather Case "

16-INCH RULE.

- 4045.** K & E Adjustable (Mannheim) Slide Rule, 16-in., engine divided, divisions on white facings, with improved Glass Indicator; in Case, with Directions . . "

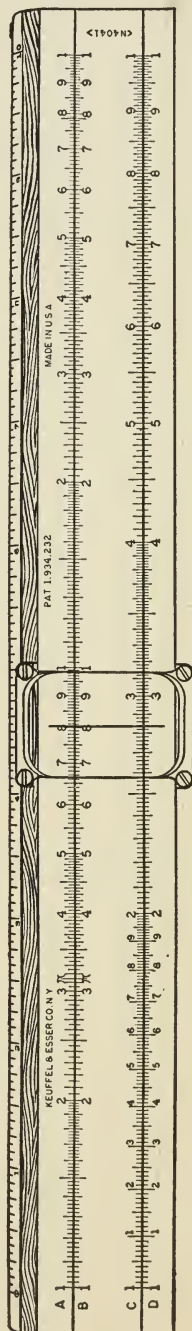
- 4045S.** Same as No. 4045 but in sewed Leather Case "

20-INCH RULE.

- 4051.** K & E Adjustable (Mannheim) Slide Rule, 20-in., engine divided, divisions on white facings, with improved Glass Indicator; in Case, with Directions . . "

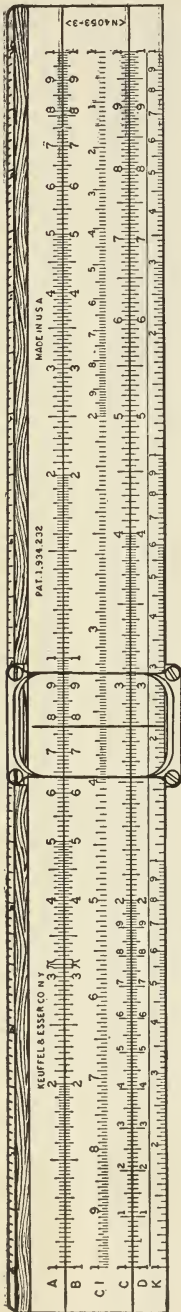
- 4051S.** Same as No. 4051 but in sewed Leather Case "

Rules 4045 and 4051 are divided more closely than the ordinary 10 inch rule. Nos. 4045 and 4051 have from 200 to 50 subdivisions between the prime numbers on the C and D scales, while the other rules have from 100 to 20, so that reading is closer than on the ordinary 10 inch rules, often to the extent of one additional significant figure.



No. N4041.

KEUFFEL & ESSER CO., NEW YORK



POLYPHASE SLIDE RULES.

(REG. U. S. PAT. OFF.)

MANNHEIM TYPE

The **POLYPHASE Slide Rule** has, in addition to the regular scales of the Mannheim, a scale of cubes on the face of the rule below the D scale and an inverted scale (CI) on the face of the slide, which scales may readily be used in conjunction with the other scales, by means of the indicator. This arrangement combines some of the features usually found on the **DUPLEX*** rules with the regular Mannheim Rule.

The inverted scale enables the operator to take three factors at one setting of the slide, and to read reciprocals by means of the indicator. Such expressions as

$$\begin{aligned} &\sqrt{a^3} ; \sqrt[3]{a^2} ; \sqrt[3]{\frac{1}{a^2}} ; \\ &a^5 ; a^6 ; a^9 ; \sqrt{a^5} ; \sqrt[3]{a^5} ; \\ &\sqrt[6]{a^5} ; \sqrt[3]{a^4} ; \sqrt[3]{\frac{a}{b^2}} ; \\ &a^2 \times \sqrt[3]{b^2} ; \sqrt{\frac{a^2 \times b^3}{c^3}} \end{aligned}$$

may be read by means of the indicator, and almost any combination of three factors involving squares, square root, cubes and cube root, may be solved at one setting of the slide.

8-INCH RULE.

- N 4053-2S. POLYPHASE (Mannheim) Slide Rule, K & E Adjustable, 8 in.,** engine divided, divisions on white facings, improved Glass Indicator; in sewed Leather Case, with Directions each
(See note under N 4035 S, page 311.)

10-INCH RULES.

- N 4053-3. POLYPHASE (Mannheim) Slide Rule, K & E Adjustable, 10 in.,** engine divided, divisions on white facings, improved Glass Indicator; in Case, with Directions
N 4053-3S. Same as No. N4053-3 but in sewed Leather Case
N 4053-3F. POLYPHASE (Mannheim) Slide Rule, like No. N4053-3, 10 in., but more closely subdivided
N4053-3FS. Same as No. N4053-3F but in sewed Leather Case

Rule No. N4053-3F has from 200 to 20 subdivisions between the prime numbers on the C and D scales, while the other 10 in. rules have from 100 to 20; so that the reading is closer, often to the extent of one additional significant figure.

20-INCH RULE.

- N 4053-5. POLYPHASE (Mannheim) Slide Rule, K & E Adjustable, 20-in.,** engine divided, divisions on white facings, improved Glass Indicator; in Case, with Directions
(See note under 4051, page 311.)
N 4053-5S. Same as No. 4053-5 but in sewed Leather Case

No. N4053-3.

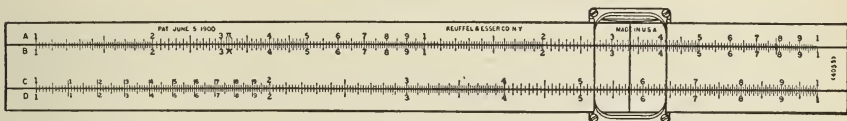
* REG. U. S. PAT. OFF.



FAVORITE SLIDE RULES.

TRADE MARK

MANNHEIM TYPE.



No. 4055.

- 4055. FAVORITE (Mannheim) Slide Rule, K & E Adjustable, 10 in.,**
engine divided, divisions on white facings, with im-
proved Glass Indicator; in Case, with Directions . . each



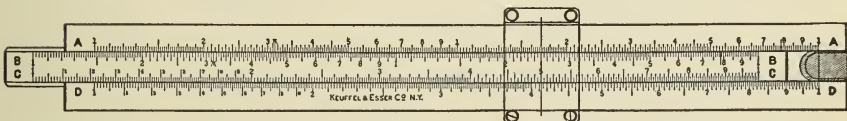
No. 4056.

- 4056. FAVORITE (Mannheim) Slide Rule, K & E Adjustable, 10 in.,**
divisions on white facings, with plain frame Glass
Indicator; in plain Case, with Directions each

The FAVORITE Slide Rules have all the scales of No. N 4041, except the centimeter and inch scales.

BEGINNERS' SLIDE RULES.

TRADE MARK



No. 4058C.

- 4058. BEGINNERS' Slide Rule, (Mannheim), 10 in., transparent**
Xylonite Indicator, in plain box with Directions . . each
The graduations of No. 4058 are printed on light colored wood.
- 4058 C.** Like 4058, but with "Frameless" Glass Indicator, in
plain case with Directions each
- 4058 W.** BEGINNERS' Slide Rule (Mannheim), 10 in., graduations
on white finish, with plain frame Glass Indicator,
in plain case with Directions "

The BEGINNERS' Slide Rules are intended only for the use of beginners to enable them to become familiar with the slide rule without incurring the expense of obtaining the regular rule intended for professional use.

They have all the scales of No. N4041, (page 311) except the centimeter and inch scales.

KEUFFEL & ESSER CO., NEW YORK

POLYPHASE DUPLEX

REG. U. S. PAT. OFF.

SLIDE RULES.

4088-1S. POLYPHASE DUPLEX Slide Rule, K & E Adjustable, 5 in., engine divided, divisions on white facings, "Frameless" Glass Indicator; in sewed Leather Case without flap; with Directions . . . each

(See note under 4031 S, page 311.)

4088-2S. POLYPHASE DUPLEX Slide Rule, K & E Adjustable, 8 in., engine divided, divisions on white facings, improved Glass Indicator, in sewed Leather Case, with Directions "

(See note under N4035S, page 311.)

4088-3. POLYPHASE DUPLEX Slide Rule, K & E Adjustable, 10 in., engine divided, divisions on white facings, improved Glass Indicator; in Case, with Directions "

4088-3S. Same as No. 4088-3, but in sewed Leather Case

N4088-5. POLYPHASE DUPLEX Slide Rule, K & E Adjustable, 20 in., engine divided, divisions on white facings, improved Glass Indicator; in Case, with Directions 22.00

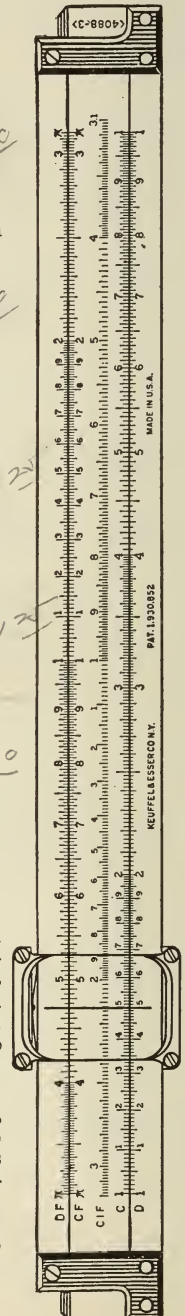
(See note under 4051, page 311.)

N4088-5S. Same as No. N4088-5, but in sewed Leather Case 23.75

The **POLYPHASE DUPLEX Slide Rule** is very valuable for the solution of problems involving exponentials, reciprocals and extended combinations of factors. Involved computations may be performed with a minimum number of settings, decreasing the possibility of error in reading, and reducing the time required to perform calculations. Any one of the scales may be read in connection with any other one by means of the indicator which encircles the rule.

In introducing the various changes and innovations enumerated, great care has been exercised to avoid complicating the rule, so that the **POLYPHASE DUPLEX Rule** can be used efficiently for the simpler problems of multiplication and division as well as for the more complicated operations encountered in the solution of various empirical formulas.

The **POLYPHASE DUPLEX** is graduated on both sides, and has the K & E slide adjustment.



4088-3. Front

KEUFFEL & ESSER CO., NEW YORK

POLYPHASE DUPLEX

REG. U. S. PAT. OFF.

SLIDE RULES.

The **POLYPHASE DUPLEX** Slide Rule has all of the scales of the **POLYPHASE*** Slide Rule, with the addition of three others known as the **CF, DF and CIF** or folded scales. The function of the folded scales is to enable factors to be taken without resetting, which would be off the rule when using the regular **C** and **D** scales.

The folded scales correspond in all respects to the **C, D** and **CI** scales, except that each has but one index which is located close to the middle of the rules. Each folded scale is thus divided into two sections: one, to the right of the index, running from 1 to π (3.1416), and the other, to the left of the index, running from π to 1. The arrangement is such that π is brought into alignment with the two indexes of the corresponding scales **C, D** or **CI**. Consequently, it enables the user to find the diameters and circumferences of circles without setting the slide; and π to be taken as a factor or divisor in any formula without an additional setting.

On the other side of the rule the scales, in order downward, are **K, A, B, S, T, CI, D** and **L**. The "**K**" is a scale of three units, each unit being one third the unit length of the **C** and **D** scales, to which it is referred. It gives directly the cube of any number on the **C** and **D** scales; and vice versa, the cube root of any number on the **K** scale is read directly on the **C** and **D** scales.

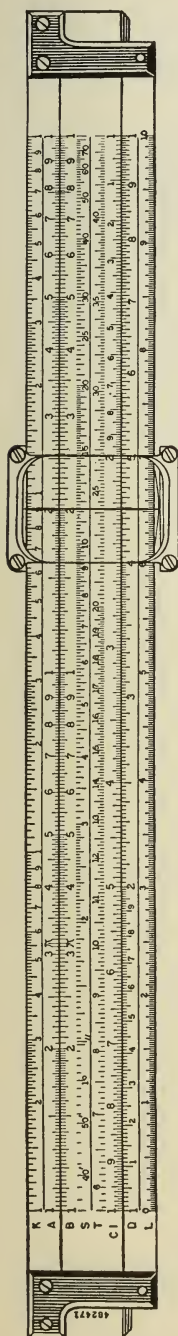
The **A** and **B** are two scales of two units each, with each unit one half the length of the **C** and **D** scales. They are so positioned that the square root of any number on them is directly read on the **C** and **D** scales; and vice versa the square of any number on the **C** and **D** scales may be read directly upon them.

The **S** on the slide is a scale of Sines from about $35'$ to 90° and is referred to the **A** and **B** scales.

The **T** on the slide is a scale of Tangents from about $5^\circ 44'$ to 45° referred to the **C** and **D** scales.

The **CI** on the slide is an inverted scale of full unit length and is adjacent to and used in conjunction with the **D** scale on the lower body of the rule.

The lower edge of the rule carries a scale of equal parts known as the **L** scale, which is used for obtaining the common logarithms of numbers. This scale is referred to the **D** scale.



4088-3. Back

* REG. U. S. PAT. OFF.

KEUFFEL & ESSER CO., NEW YORK

LOG LOG TRIG
TRADE MARK
AND
LOG LOG DECITRIG
REG. U. S. PAT. OFF.
SLIDE RULES.

- 4090-3.** LOG LOG TRIG Slide Rule, K & E Adjustable, 10 in., **DUPLEX**,* engine divided, divisions on white facings, improved Glass Indicator; with **Trigonometrical Scales** divided to degrees and minutes; in Case, with Directions. each
- 4090-3S.** Same as No. 4090-3, but in sewed Leather Case. "
- 4091-3.** LOG LOG DECITRIG Slide Rule, like No. 4090-3, but with **Trigonometrical Scales** divided to degrees and decimals of a degree. "
- 4091-3S.** Same as No. 4091-3, but in sewed Leather Case. "

Nos. 4090 and 4091 are alike except in the subdivision of the trigonometrical scales; which, when decimally subdivided, like No. 4091, find their principal use in electrical engineering calculations.

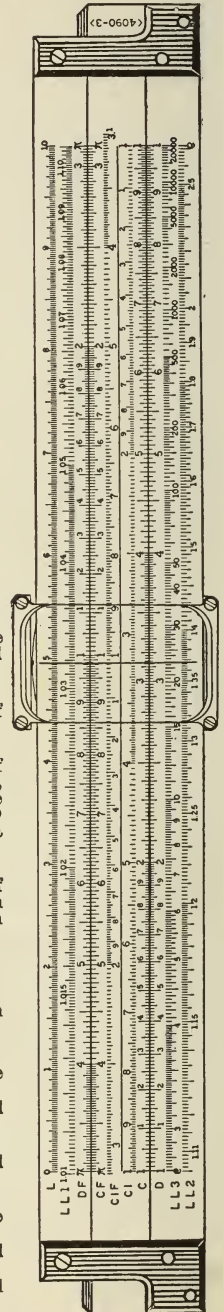
These slide rules have all the scales of the **LOG LOG DUPLEX*** Slide Rules, (see page 318) but the trigonometrical scales have been expanded and rearranged.

On one face are the following scales:

- L**, a scale of equal parts (for finding common logarithms of numbers).
- LL1**, a Log Log scale.
- DF**, a full length D scale folded. This arrangement admits of the handling of factors which, in rules without these scales, would frequently require the slide to be reset. Since the constant π is in alignment with the indices of the C and D scales, π can be taken as a factor or divisor in any formula without an additional setting.
- CF**, a full length C scale, folded like the DF scale.
- CIF**, a full length inverted folded scale, giving reciprocals of numbers on the CF scale. The inverted scale in connection with the direct scales admits of handling three factors with one setting of the slide, or four factors if π is included.
- CI**, a full length C scale inverted.
- C**, a single logarithmic scale.
- D**, a single logarithmic scale like C.
- LL3, LL2**, full unit length Log Log scales, which with LL1 form a continuous log log scale from 1.01 ($e^{-0.1}$) to 22,000 (e^{10}).

On the reverse face are the following scales:

- LL0**, a Log Log scale of decimal quantities, referred to the A and B scales.
- A**, a two unit logarithmic scale giving directly squares and square roots.
- B**, a two unit logarithmic scale exactly like A.
- K**, a three unit logarithmic scale, giving directly cubes and cube roots.
- CI**, a full length C scale inverted.
- T**, a full length scale of Tangents and Cotangents, double numbered from $5^{\circ}44'$ or 5.73° to $84^{\circ}17'$ or 84.28° .
- S2**, a full length scale of Sines and Cosines, double numbered from $5^{\circ}44'$ or 5.73° to 90° .
- S1**, a full length scale of Sines and Cosines, double numbered from $0^{\circ}34'$ or 0.58° to $5^{\circ}44'$ or 5.73° .



No. 4090-3. Front

KEUFFEL & ESSER CO., NEW YORK

LOG LOG TRIG TRADE MARK AND LOG LOG DECITRIG REG. U. S. PAT. OFF. SLIDE RULES.

These rules have been evolved to meet the growing demand for slide rules better adapted to handle the varied problems involving trigonometrical functions. They have all the scales of the **LOG LOG DUPLEX*** Slide Rule. The trigonometrical scales, however, have been so re-arranged and expanded that greater accuracy in all trigonometrical computations is assured; and, in addition, the right triangle can be solved with only one setting of the slide, the required sides, or the required angle and hypotenuse being immediately determined. This easy and rapid solution of the right triangle is particularly valuable in Vector problems, which involve frequent changes from polar to rectangular co-ordinates, and vice versa.

TRIGONOMETRICAL SCALES.

On scale D the following can be read directly:

Sines of all angles from $0^{\circ}35'$ or 0.58° to 90° .

Cosines of all angles from 0 to $89^{\circ}25'$ or 89.42° .

Tangents of all angles from $5^{\circ}44'$ or 5.73° to 45° .

Cotangents of all angles from 45° to $84^{\circ}17'$ or 84.28° .

On scale CI (with the indices in alignment) the following can be read directly:

Tangents of all angles from 45° to $84^{\circ}17'$ or 84.28° .

Cotangents of all angles from $5^{\circ}44'$ or 5.73° to 45° .

Cosecants of all angles from $0^{\circ}35'$ or 0.58° to 90° .

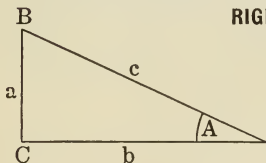
Secants of all angles from 0 to $89^{\circ}25'$ or 89.42° .

Example: Find the trigonometrical functions of $14^{\circ}30'$ (14.5°).

Set indicator to $14^{\circ}30'$ (14.5°) on S2 and read the sine 0.2504 on D and its cosecant 3.994 on CI. Set indicator to $14^{\circ}30'$ (14.5°) (red) on S2 and read the cosine 0.968 on D and the secant 1.033 on CI.

Set indicator to $14^{\circ}30'$ (14.5°) on T, and read the tangent 0.2586 on D and the cotangent 3.867 on CI.

RIGHT TRIANGLES



Given sides a and b. Find hypotenuse c and angle A.

Rule: Set the shorter side a (or b) on scale CI to an index of the T scale. Below b (or a) on scale CI read the angle A on scale T. Above angle A on scale S1 or S2 read the hypotenuse c on scale CI. If the side b is the shorter, angle A is greater than 45° and the co-numbers in red on scales T and S must be employed.

Example: $a=5$, $b=12$. Find c and A.

Set 5 on scale CI to the left index of T. Below 12 on scale CI read $A=22^{\circ}37'$ (22.6°) on scale T. At $22^{\circ}37'$ (22.6°) on scale S2 read $c=13$ on scale CI.

Given hypotenuse c and angle A. Find sides a and b.

Rule: Set c on scale CI to A on scale S1 or S2. At A on scale T read the longer side a (or b) on scale CI. At the index of T read the shorter side b (or a) on scale CI.

Example: $c=2.5$, $A=16^{\circ}15'$ (16.25°) Find a and b.

Set 2.5 on scale CI to $16^{\circ}15'$ (16.25°) on scale S1. At $16^{\circ}15'$ (16.25°) on scale T read 2.4, the longer side b, on scale CI. At the left index of T read 0.7, the shorter side a, on scale CI.

No. 4090-3. Back

* REG. U. S. PAT. OFF.

KEUFFEL & ESSER CO., NEW YORK

LOG LOG DUPLEX

REG. U. S. PAT. OFF.

SLIDE RULES.

4092-3. LOG LOG DUPLEX Slide Rule, K & E Adjustable, 10 in., engine divided, divisions on white facings, improved Glass Indicator; in Case, with Directions . . each 10²

4092-3S. Same as No. 4092-3 but in sewed Leather Case " 11²

N4092-5. Similar to No. 4092-3 but 20 in. " 25³⁰
(See note under 4051, page 311).

N4092-5S. Same as No. 4092-5, but in sewed Leather Case " 37¹⁰

The LOG LOG DUPLEX Slide Rule has, in addition to the scales of the POLYPHASE DUPLEX* Slide Rule, a Log Log scale (representing the Logarithms of the Logarithms of a series of natural numbers) of quantities greater than unity, three fold, graduated from 1.01 to 22,000, with which any root or power of any quantity may be rapidly determined, in general by direct operation at one setting of the slide. The hyperbolic or natural logarithm of a quantity with its characteristic may be read by means of the indicator without setting the slide, or may be used directly as a factor when required in any formula.

Also a Log Log scale of decimal quantities, called LLO, which has a range of .97 to .05. It is referred to the A and B scales and is so proportioned that the hyperbolic co-logarithms of numbers on it are read directly on scale A.

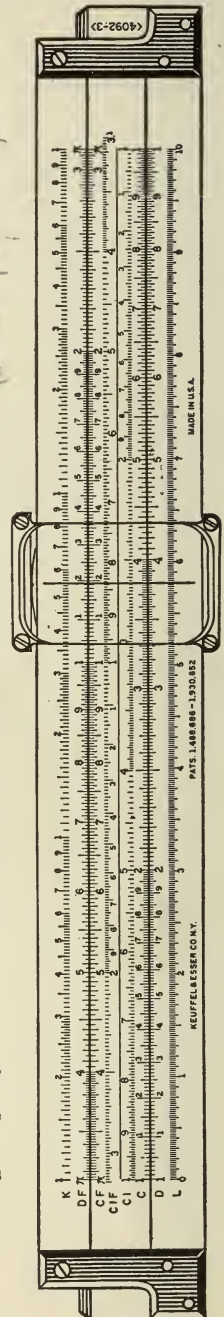
Exponentials generally, and the many formulas in electrical and mechanical engineering, involving fractional powers or roots, hyperbolic logarithms, etc., are readily handled with the help of this rule.

On one face (see illustration to right) are the following scales:

- K, three complete logarithmic scales, giving directly cubes and cube roots.
- DF, a full length D scale folded. The graduations begin and end approximately at the center of the rule, the scales being so placed as to bring the division π in line with both indexes of the lower D scale. This arrangement admits of the handling of factors which, in rules without these scales, would frequently require the slide to be reset. Incidentally, it enables the user to find the diameters and circumferences of circles without setting the slide; and π to be taken as a factor or divisor in any formula without an additional setting.
- CF, a full length C scale, folded like the DF scale.
- CIF, a full length inverted folded C scale, whose index is in line with the indexes of the DF and CF scales.
- CI, a full length C scale inverted.
- C, a full length C scale.
- D, a full length D scale.
- L, a scale of equal parts (for finding common logarithms of numbers).

On the other face of the rule (see illustration on opposite page) are the following scales:

- LLO, a Log Log scale of decimal quantities.
- A, two complete logarithmic scales, giving directly squares and square roots.
- B, two complete logarithmic scales, exactly like A.
- S, the usual trigonometric scale of sines.
- T, the usual trigonometric scale of tangents.
- C, a full length C scale.
- LL1, LL2, LL3, a continuous Log Log Scale in three parts.



No. 4092-3 Front

KEUFFEL & ESSER CO., NEW YORK

LOG LOG DUPLEX

REG. U. S. PAT. OFF.

SLIDE RULE.

The value of the Log Log Scales is best appreciated in determining powers and extracting roots. The number whose power or root is desired is taken on the Log Log Scale, while the exponent or root index is taken on the C scale for quantities greater than unity, and on the B scale for quantities less than unity. Hence, the solution of these problems involves no more work than would be required in ordinary multiplication or division on other slide rules. Powers and roots may be found in this way by those who are not acquainted with the ordinary mathematical processes employed in similar cases.

The saving in time and labor through the use of the Log Log Scales is best illustrated in finding a numerical expression for x^n or $\sqrt[n]{x}$. With the ordinary slide rule the logarithm of x is first determined on one scale, then $\log x$ is multiplied or divided by n through the manipulation of two other scales, and the result referred back to the original scale. This involves 4 settings of the indicator, one setting of the slide, and 3 scales. With the Log Log scales, x is either multiplied or divided by n directly; involving only 2 settings of the indicator, one setting of the slide, and 2 scales. No inspection of the result is necessary where the Log Log scales are employed, since the answer as found is already pointed off.

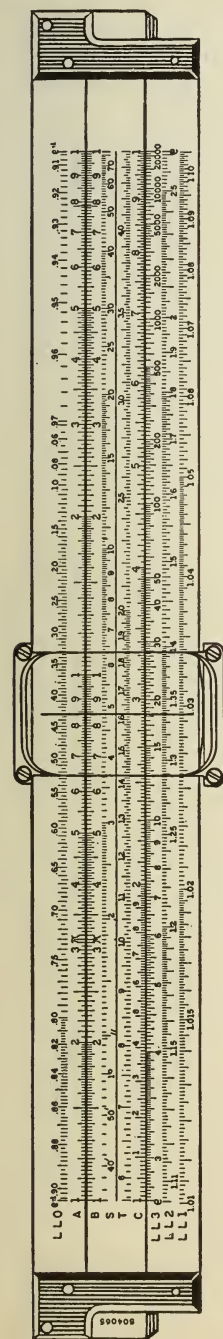
When the indexes of the Log Log scales of quantities greater than unity are in alignment with those of the slide, the Hyperbolic or Natural Logarithm of any number on the Log Log scales may be directly read upon the C scale. Logarithms to any other base are made instantly available through setting the index of the slide to the number representing the required base on the Log Log scale.

On the Log Log scale of quantities less than unity, problems involving powers and roots of fractions are easily solved by processes which are exactly like those of multiplication and division on the common scales of all slide rules. The limits of this scale are .05 and .97; but problems involving quantities below .05 and between .97 and 1.01 are easily and rapidly solved by simple methods explained in the book of instructions.

While simple problems involving powers, roots and logarithms are almost instantly solved by means of the Log Log scales, it is also true that equations like the following:

$$y = \frac{a}{2} \left(e^{\frac{x}{a}} + e^{-\frac{x}{a}} \right) \quad C = \frac{l}{2 \log_e \frac{l_1}{r}} \quad R = \frac{It}{C (\log_e E_1 - \log_e E_2)}$$

and similar ones found in Electrical Engineering and other calculations, are solved much more easily and rapidly by means of the same scales than by any other mathematical process.



KEUFFEL & ESSER CO., NEW YORK

LOG LOG VECTOR SLIDE RULES.

REG. U. S. PAT. OFF.

4093-3. LOG LOG VECTOR Slide Rule, K & E Adjustable, 10 in., DUPLEX,* engine divided, divisions on white facings, improved Glass Indicator; in Case, with Directions each

4093-3S. Same as No. 4093-3 but in sewed Leather Case “

4093-5. Similar to No. 4093-3 but 20 in “
(See note under No. 4051, page 311).

4093-5S. Same as No. 4093-5 but in sewed Leather Case “

The LOG LOG VECTOR Slide Rule is of particular value to electrical engineers and students of electrical engineering.

Vector computations, graphically represented by right triangles, involve frequent changes from polar to rectangular co-ordinates, and vice versa. By ordinary methods, using logarithmic and trigonometric tables, the solution of right triangles is tedious and time consuming; but becomes easy and rapid when the Log Log Vector Slide Rule is employed.

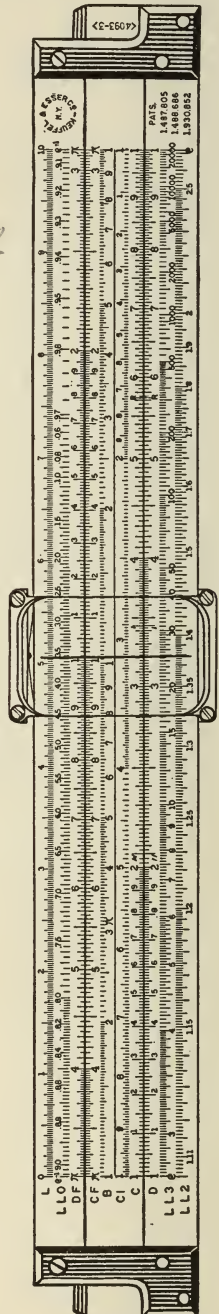
The LOG LOG VECTOR Slide Rule, in addition to the most useful scales of the K & E LOG LOG DUPLEX* rule, has scales of circular and hyperbolic functions, so arranged that the right triangle can be solved at one setting of the slide. The rule is thus well adapted to all calculations ordinarily encountered by the engineer.

On one face are the following scales:

- L, a scale of equal parts (for finding common logarithms of numbers).
- LLO, a Log Log scale of decimal quantities.
- DF, a full length D scale folded. The graduations begin and end approximately at the center of the rule, the scales being so placed as to bring the divison π in line with both indexes of the lower D scale. This arrangement admits of the handling of factors which, in rules without these scales, would frequently require the slide to be reset. Incidentally, it enables the user to find the diameters and circumferences of circles without setting the slide; and π to be taken as a factor or divisor in any formula without an additional setting.
- CF, a full length C scale, folded like the DF scale.
- B, Two complete logarithmic scales, giving directly squares and square roots.
- CI, a full length C scale inverted.
- C, a single logarithmic scale.
- D, a single logarithmic scale.
- LL2, LL3, a continuous Log Log Scale in two parts.

On the other face of the rule are the following scales:

- Sh1, Sh2, a continuous scale of Hyperbolic Sines in two parts.
- Th, a scale of Hyperbolic Tangents.
- Sl1, Sl2, a continuous scale of Sines inverted, decimally divided, double numbered, in two parts.
- Tl, a scale of Tangents, inverted, decimally divided, double numbered.
- D, a single logarithmic scale.
- S, a scale of Sines, decimally divided.
- T, a scale of Tangents, decimally divided.



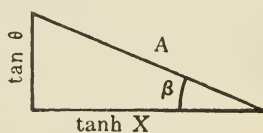
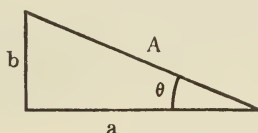
* REG. U. S. PAT. OFF.

KEUFFEL & ESSER CO. NEW YORK

LOG LOG VECTOR REG. U. S. PAT. OFF. SLIDE RULE.

The value of the **LOG LOG VECTOR Slide Rule** will best be appreciated by those who have had to solve their vector problems by other more laborious and tedious means. The saving in time and labor through the use of the **LOG LOG VECTOR Slide Rule** is exemplified in the general rules for the use of the rule and the few examples given below.

Vectors and their components are conveniently expressed algebraically in complex notation thus, $a+jb=Ae^{j\theta}=A\angle\theta$. In this expression $a+jb$ represents the rectangular components of the vector $A\angle\theta$, and $Ae^{j\theta}$ is an exponential expression of the vector in polar co-ordinates.



GENERAL RULES AND EXAMPLES.

Given $a+jb$: find $A\angle\theta$.

Rule: To the smallest side b (or a) on scale D, set an index of the slide. Over the other side a (or b) on scale D read angle θ on scale TI. Move indicator to angle θ on scale SI, and read A on scale D.

If side a is the smaller, then angle θ is greater than 45° , and must be so read by means of the co-numbers in black on scales SI and TI.

Example: $a+jb=1.2+j.5$. Find $A\angle\theta$.

Set right index of slide to .5 on scale D. Over 1.2 on D read $\theta=22.6^\circ$ on TI. Move indicator to 22.6 on SI2, and read $A=1.3$ on scale D.

Given $A\angle\theta$. Find $a+jb$.

Rule: To A on scale D set angle θ on scale SI. At index 1 of the slide read the smaller side b (or a) on scale D. At angle θ on scale TI read the other side a (or b) on scale D.

Example: $A\angle\theta=2.5/16.27^\circ$. Find $a+jb$.

To 2.5 on D set 16.27° on SI2. At index read the small side $b=.7$ on D. At 16.27° on TI read $a=.24$ on D.

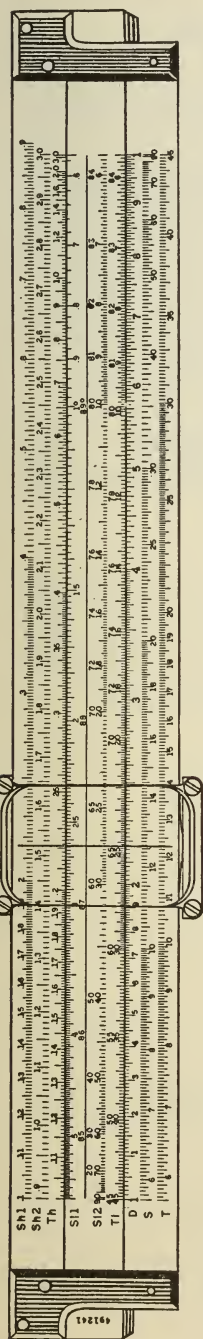
Given $\tanh X + j \tan \theta$. Find Vector angle β and side A .

Rule: Any side of the triangle may be expressed in terms of hyperbolic or any other function, which is referred to scale D, and the triangle may be solved in the same way, at a single setting of the slide.

Example: $\tanh .24 + j \tan 28.2^\circ$

Inspection of the numerical values of the given functions, show that $\tan 28.2^\circ > \tanh .24$, hence angle $\beta > 45^\circ$

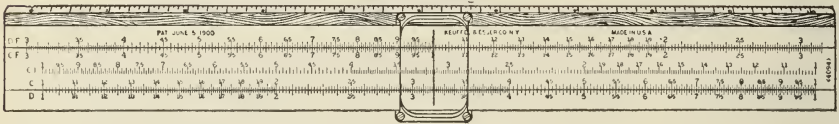
Set left index of the slide to .24 on scale Th. Move indicator to 28.2° on scale T and read $\beta=66.3^\circ$ on scale TI red. Move indicator to 66.3° on scale SI red, and read $A=.586$ on scale D.





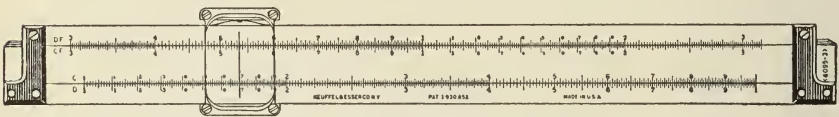
MERCHANTS' SLIDE RULE.

TRADE MARK

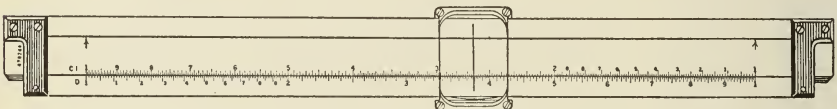


4094. Front showing all scales (DF, CF, CI, C and D)

- 4094. MERCHANTS' (Mannheim) Slide Rule, K & E Adjustable, 10 in.,**
 engine divided, divisions on white facings, improved
 Glass Indicator; in Case with Directions each



4095-3. Front, showing DF, CF, C and D scales.



4095-3. Back, showing CI and D scales.

- 4095-1S. MERCHANTS' Slide Rule, K & E Adjustable, 5 in., DUPLEX***
 engine divided, divisions on white facings, K & E
 "Frameless" Indicator: in sewed Leather Case, with-
 out flap, with Directions, each

- 4095-3. MERCHANTS' Slide Rule, K & E Adjustable, 10 in., DUPLEX,***
 engine divided, divisions on white facings, improved
 Glass Indicator; in Case, with Directions, each

- 4095-3S.** Same as No. 4095-3, but in sewed Leather Case each

Especially designed for the merchant, importer, exporter, accountant, manager, mechanic, foreman, etc. By means of it, all manner of problems involving multiplication, division and proportion can be correctly solved without mental strain and in a small fraction of the time required to work them out by the usual "figuring".

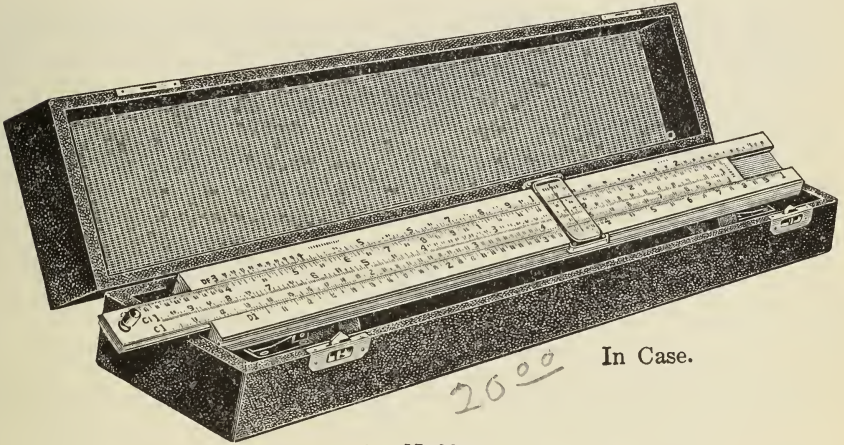
For instance, rapid calculation is made possible of such problems as the following, which are of every day occurrence in office and shop: Discounts, simple and compound interest, pro-rating, converting feet into meters, pounds into kilograms, foreign moneys into U. S. money, taking of a series of discounts from list prices, adding profit to costs, while dozens of equivalents are instantly shown, such as: cubic inches or feet in gallons, and vice versa; centimeters in inches, inches in yards, or feet; kilometers in miles, square centimeters in square inches, litres in cubic feet, kilograms in pounds; pounds in gallons; feet per second in miles per hour; circumference and diameter of circles.

* REG. U. S. PAT. OFF.

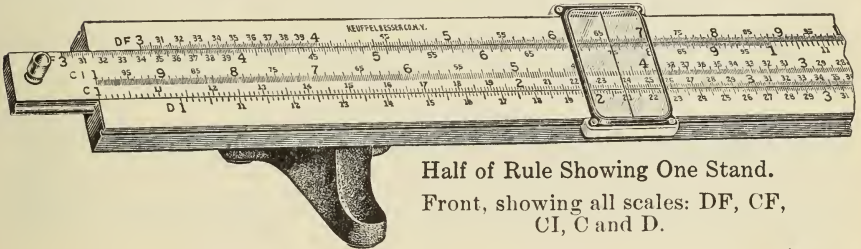
KEUFFEL & ESSER CO., NEW YORK

K & E DESK SLIDE RULE

REG. U. S. PAT. OFF.



No. N4096.



Half of Rule Showing One Stand.

Front, showing all scales: DF, CF, CI, C and D.

N4096. Desk Slide Rule (Mannheim), K & E Adjustable, 20 in., engine divided, divisions on white facings, improved Glass Indicator; on metal stands; in leatheret covered case with directions . . . each

The K & E Desk Slide Rule has been especially designed for the Merchant, Importer, Exporter, Accountant, Manager, Mechanic, Foreman, and others, whose computations involve only multiplication, division, proportion and percentage.

In construction, the rule is of the Mannheim Type. The arrangement of the scales admits of the handling of factors which, in rules without this arrangement would frequently require the slide to be reset.

The Slide Rule (about 20½ inches long overall) is firmly fastened to two metal stands, which are sufficiently heavy to prevent the rule from shifting about when the slide is manipulated. These stands keep the face of the rule elevated about 1½ inches above the desk or table. The bottom of each stand is provided with three solid rubber buffers.

The rule is so inclined upon the stands that its face is perpendicular to the line of vision of the normal observer.

The slide, near the left end, is provided with a nickel silver knob, which makes proper setting with one hand a very convenient operation.

The graduations are very distinct and the numbers large, thus reducing eye-strain to a minimum.

The Desk Slide Rule is furnished in a strong, handsome case. Two strong spring clips are fastened to the bottom of the case inside. Each clip engages a lug on the metal stands, and holds the rule immovably in the case. A pressure of the thumb releases each clip, freeing the rule for immediate removal from the case. The entire design is such that, the rule may be operated as readily in the case as out of it. Total weight, rule and case, about 3¼ lb.



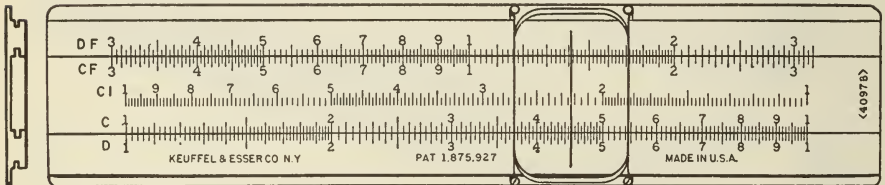
EVER-THERE SLIDE RULES.

REG. U. S. PAT. OFF.

The **EVER-THERE Slide Rules** are made entirely of white Xylonite, a strong, tough material. On this base the graduations are engine-divided. The handiness of the **EVER-THERE** slide rules is evident from the fact that they weigh no more than a fountain pen, and are much less bulky in the pocket.

The **Ever-There Slide Rules** Nos. 4097B, C and D are pre-eminently pocket instruments, as the following dimensions will indicate:

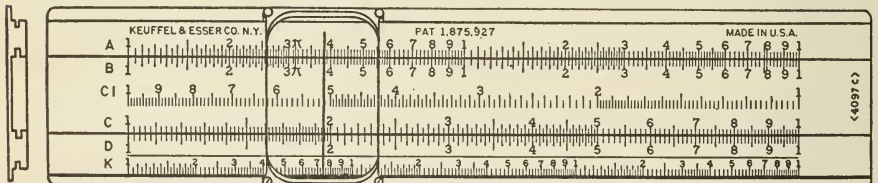
Length over all.....	6 inches.	Width over all.....	1 $\frac{3}{32}$ inches.
Thickness.....	$\frac{1}{16}$ inch.	Thickness of Indicator.....	$\frac{1}{16}$ inch.
Weight.....	about $\frac{1}{4}$ ounce.		



No. 4097B

4097B. EVER-THERE Slide Rule, 5 in., white Xylonite, engine divided, improved Glass Indicator, in high-grade leather sheath, with Directions..... 3.20 each
 No. 4097B is old No. 4097

The calculating scales of No. 4097B are all upon the front face. The CF and DF are folded scales, the function of which is to enable factors to be taken without resetting, which would be off the rule when using the regular C and D scales. These folded scales correspond in all respects to the C and D scales, except that each has but one index which is located close to the middle of the rule. The CI scale, an inverted C scale, when used in conjunction with the other scales, enables the operator to take three factors at one setting of the slide and to read reciprocals. The back of the rule has a five inch scale divided in inches to 16ths, and a 13 cm. scale divided in centimeters to millimeters.



No. 4097C

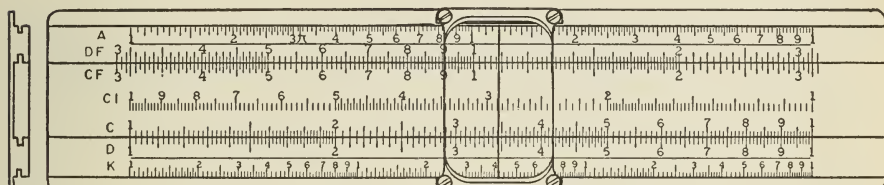
4097C. EVER-THERE Slide Rule, 5 in., white Xylonite, engine divided, improved Glass Indicator, with Logarithmic and Trigonometrical Scales; in high-grade leather sheath, with Directions..... 3.20 each
 No. 4097C is old No. 4098.

The size, form, weight and handiness of the No. 4097C **EVER-THERE Slide Rule** are identical with those of No. 4097B, as described above. The scales are the same as those described under the **Polyphase** Slide Rule No. N4053-3, page 312 and are, on the front face, A, B, CI, C, D and K, and on the back of the slide, S, L and T. It has also the inch and centimeter scales as described under No. 4097B above. The slide is reversible.



EVER-THERE SLIDE RULES.

REG. U. S. PAT. OFF.



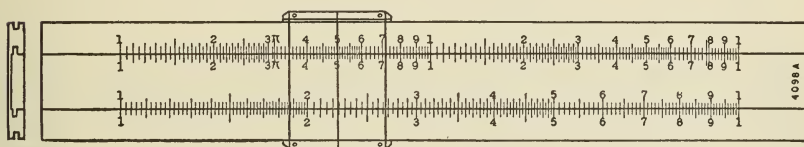
No. 4097D.

- 4097D. EVER-THERE** Slide Rule, 5 in., white Xylonite, engine divided, improved Glass Indicator; with **Logarithmic, Trigonometrical and Folded Scales**; in high-grade leather sheath, with Directions, each 420

No. 4097D has the same size, form and weight, as Nos. 4097 B and C. On the front face it carries the A, DF, CF, CI, C, D and K scales, and, on the back of the reversible slide, the B, S, L and T scales. Hence, it has all the scales of the **Polyphase Duplex*** rule (see page 314), except the CIF scale. It also has the inch and centimeter scales on the back of the rule, as described under No. 4097 B.

K & E POCKET SLIDE RULE.

REG. U. S. PAT. OFF.



No. 4098A.

- 4098A. K & E Pocket Slide Rule**, 5 in., white Xylonite, "Frameless" transparent Xylonite Indicator, with **Mannheim Scales**, in leather sheath, with Directions. each 170

The K & E Pocket Slide Rule is made entirely of white Xylonite, a strong, tough material. It weighs less than a fountain pen, and is much less bulky in the pocket. It is pre-eminently a pocket instrument, as the following dimensions will indicate:

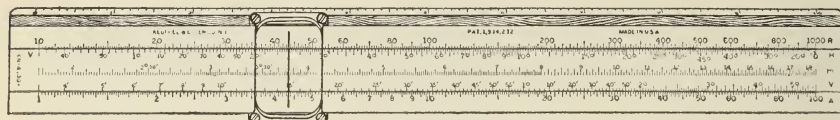
Length over all.....6 inches	Width over all .....1 $\frac{3}{4}$ inches
Thickness $\frac{1}{8}$ inch	Thickness over indicator $\frac{3}{16}$ inch
Weight.....about $\frac{3}{8}$ ounce	

The front face of this rule carries the A, B, C and D scales. The Trigonometric scales S and T, and the Logarithmic Scale L are on the back of the slide, which is not reversible.

The back of the rule has a five inch scale divided in inches to 16ths, and a 13 cm. scale divided in centimeters to millimeters.



STADIA SLIDE RULES.



No. N4100.

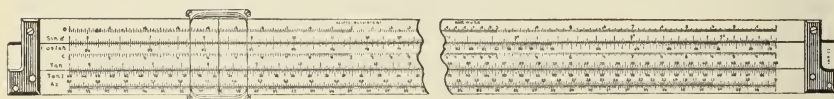
- N4100.** K & E STADIA (Mannheim) Slide Rule K & E Adjustable, engine divided, 10 in. divisions on white facings, improved Glass Indicator; in Case, each 7⁰⁰
- N4100S.** Same as No. N4100 but in sewed Leather Case " 7⁸⁰
- N4101.** K & E STADIA Slide Rule like No. N4100, but 20 in.; in Case, " 16⁰⁰
- N4101S.** Same as No. N4101 but in sewed Leather Case " 17⁵⁰

The very simple Directions are printed on the rule.

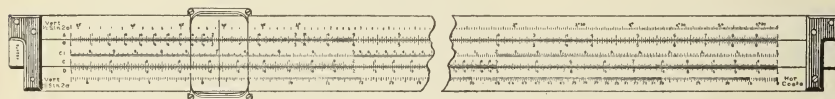
This form of Stadia Slide Rule is remarkable for its simplicity. By one setting of the slide, the horizontal distance and vertical height can be obtained at once, in every case where the Stadia rod reading and vertical angle are known. For the angles commonly encountered in stadia surveying, the values thus found are correct to the nearest 1/10 of a foot, and sometimes closer. The 20-inch rule naturally gives values which are, in general, more precise than those obtained with the 10-inch rule.

The under side of the slide has a scale corresponding to the lower scale of the rule and resembling the A and B scales of the Mannheim and DUPLEX* rules, so that the rule can be used also for ordinary slide rule computations. One edge is graduated in inches and tenths, to serve as a scale for distances.

SURVEYOR'S DUPLEX REG. U. S. PAT. OFF. SLIDE RULE.



Front



Back

No. N4102

- N4102.** SURVEYORS' DUPLEX Slide Rule, K & E Adjustable 20 in., engine divided, divisions on white facings, improved Glass Indicator; in Case, with Directions each
- N4102S.** Same as No. N4102 but in sewed Leather Case "

All astronomical data essential to surveying, such as azimuth, time, latitude, etc., can be ascertained by means of the usual type of Transit with vertical circle but without solar attachment. While the observations may be made with great rapidity, the computations are tedious and require a great deal of time.

The K & E Surveyors' Slide Rule entirely eliminates this difficulty by reducing the hitherto complicated calculations to mere mechanical operations, thereby rendering the method of field astronomy with the regular Engineer's Transit extremely simple and practical.

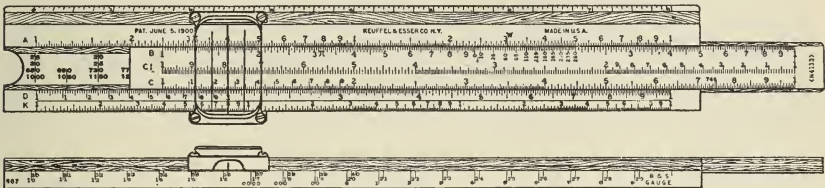
One face is arranged for the determination of the meridian by direct solar observations; it also carries the sine and cosine scales used in computing the latitudes and departures of the course.

The other face has the usual scales A, B, CI, C and D, for all general numerical calculating, as well as two full length stadia scales for computing horizontal distances and vertical heights.

* REG. U. S. PAT. OFF.



THE ROYLANCE ELECTRICAL (IMPROVED). SLIDE RULE.



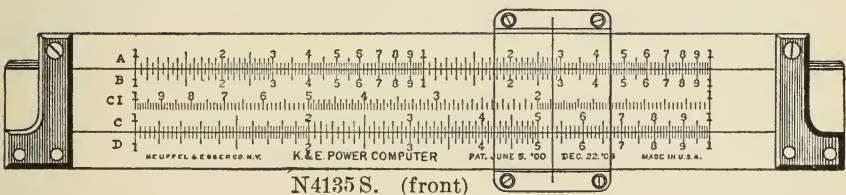
No. N4133 S.

N4133S. ROYLANCE ELECTRICAL (Mannheim) Slide Rule, K & E Adjustable, 8 in., engine divided, divisions on white facings, improved Glass Indicator; in sewed Leather Case, with Directions each 9⁰⁰

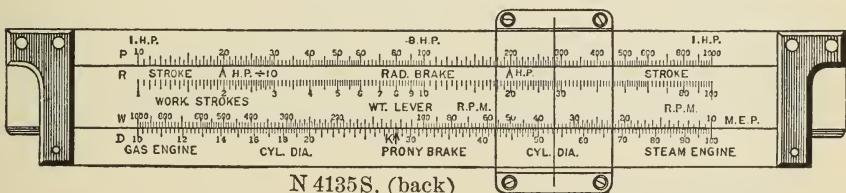
The Roylance Electrical Slide Rule is a modification of the regular K & E POLYPHASE* Slide Rule No. N4053-2S and can be used for all the calculations made with the ordinary Slide Rule. In addition to the usual POLYPHASE* scales it carries a series of scales or gauge marks by means of which the different properties of copper wire, such as size, conductivity, weight, etc., may be determined without the use of tables.

Other features embodied in the rule are the extra hair lines on the Indicator for the calculation of circular areas, the special gauge mark (746) for the conversion of Horse-power and Kilowatts, and a special set of figures giving the temperature of wire in degrees Centigrade corresponding to resistance in ohms per 1000 feet.

POWER COMPUTING SLIDE RULE.



N4135 S. (front)



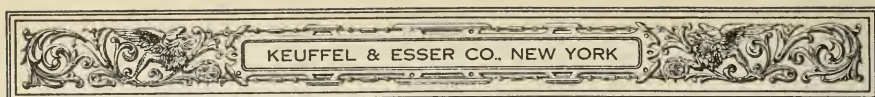
N 4135 S. (back)

N 4135S. K & E POWER COMPUTING Slide Rule, DUPLEX*, K & E Adjustable, 5 inch, engine divided, divisions on white facings, "Frameless" Glass Indicator; in sewed Leather Case without flap, with Directions each 10⁰⁰

This Slide Rule is specially designed for use in computing Power and Dimensions of Steam, Gas and Oil Engines; since it gives all data for finding speed, length of stroke, dimensions of cylinder, etc.

The front face of the rule carries the usual A, B, C, D and CI scales the same as on the front face of the K & E POLYPHASE* Slide Rule.

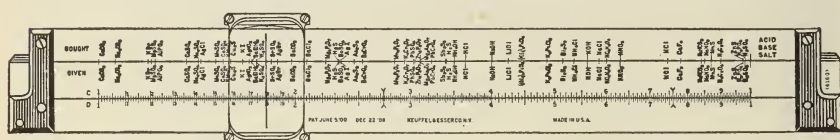
The reverse face carries a series of special graduations for use in computing power and dimensions of Steam, Gas and Oil Engines; and it gives all data for finding speed, length of stroke, dimensions of cylinder, B. H. P., I. H. P., etc.



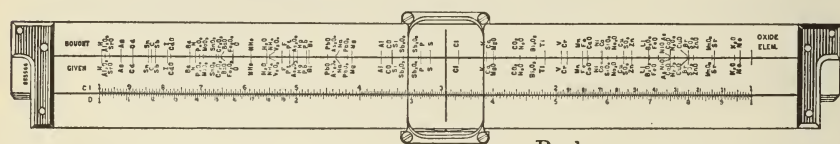
CHEMIST'S DUPLEX

REG. U. S. PAT. OFF.

SLIDE RULE.



Front.



Back.

No. 4160.

- 4160. CHEMIST'S DUPLEX** Slide Rules **K & E** Adjustable, 10 in., engine divided, divisions on white facings, improved Glass Indicator; in Case, with Directions each

1200
1300

- 4160S.** Same as No. 4160 but in sewed Leather Case “

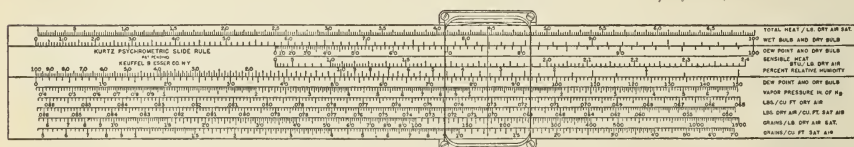
The **CHEMIST'S DUPLEX** Slide Rule designed by Dr. R. Harman Ashley, makes possible the rapid solution of problems in Stoichiometry, such as Gravimetric Analysis, Volumetric Analysis, Equivalents, Percentage Composition, Conversion Factors, Volume of Gas from a given weight of substance at different temperatures and pressures, and many other analogous problems.

Aside from the solution of the chemical problems above referred to, any arithmetical problems solvable by logarithms are readily and accurately done with a minimum number of settings.

KURTZ PSYCHROMETRIC

SLIDE RULE.

KH0



No. 4175.

- 4175. KURTZ PSYCHROMETRIC** Slide Rule, 10 in., graduations on white finish, improved Glass Indicator; in Case with Directions each

The calculation of all air conditioning problems, heretofore figured by means of the burdensome psychrometric charts or tables, can now be accomplished by the new **Kurtz Psychrometric Slide Rule**. This rule entirely replaces the psychrometric chart, and it affords a simpler and more accurate means of determining any or all of the necessary air conditioning factors.

One or two settings of the slide on this Slide Rule provide for the determination of the unknown fundamental factors, when two or more of the following fundamental factors are known, viz.: dry bulb temperature, wet bulb temperature, dew point temperature, relative humidity.

In addition, the following properties of air can be read at a glance: vapor pressure in inches of mercury; weight of dry air per cubic foot; weight per cubic foot of saturated air; grains of moisture per pound of dry air; grains of moisture per cubic foot of dry air saturated; total heat (b. t. u.) per pound of dry air saturated with moisture (above 0°); sensible heat (b. t. u.) per pound of dry air (above 0°).

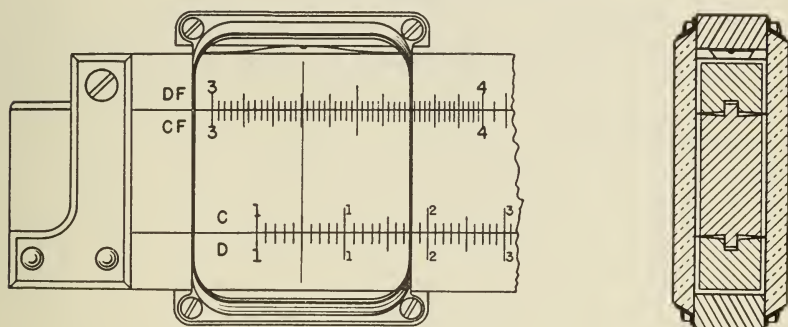
An additional feature is the group of tables and fundamental formulas, pertinent to air conditioning in general, printed on the back of the rule as a handy reference for the user.



K & E SLIDE RULES.

REG. U. S. PAT. OFF.

IMPROVED GLASS INDICATOR

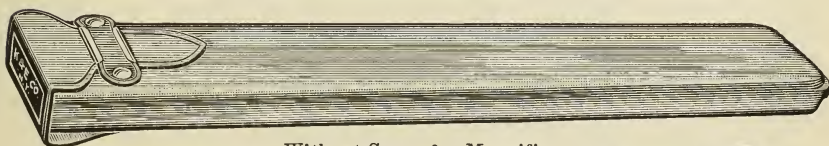


K & E Adjustable Slide Rules, with few exceptions, are now equipped with the K & E Improved Glass Indicator, in which the glass is surrounded and protected by a frame formed from one piece of stainless steel. This metal frame has flanges through which the screws pass to hold the glass to the ends or sliding pieces of the indicator. The frame surrounding the glass does not overlap its faces; hence, every number on the rule is visible at all times. Consequently, the improved indicator offers the chief advantage of the "Frameless" indicator—i.e. visibility—and, in addition, a much greater insurance against damage to the glass.

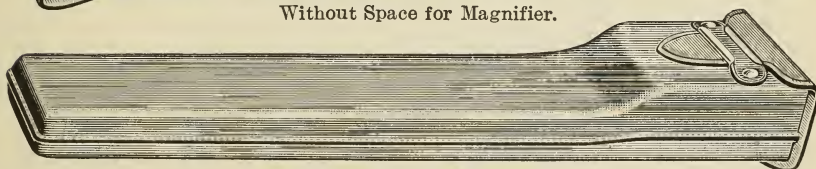
For Indicators and Glasses, see pages 330 and 331.

SEWED LEATHER CASES FOR SLIDE RULES.

See pages 330 and 331.



Without Space for Magnifier.



With Space for Magnifier.

Sewed leather cases are made of the best top-grain cowhide, handsewed; and are lined with real chamois. The loop on the case through which the tongue passes has friction springs. These springs insure that the flap will not open accidentally.

KEUFFEL & ESSER CO., NEW YORK

GLASSES,* INDICATORS,* MAGNIFIERS AND CASES

FOR K & E SLIDE RULES.

Cat. No. of Slide Rule	Indicator No.	Glass No.		Magnifier No.	Sewed Leather Case No.	Cat. No. of Slide Rule	Indicator No.	Glass No.		Magnifier No.	Sewed Leather Case No.
		Improved	"Frameless"					Improved	"Frameless"		
4031 S	A	.....	1	4185 A	O	4092-5	IL	7L	7	4185 C	Z
4035 S	B	.....	2	.....	P	N 4092-5	IaL	7L	7	4185 C	Z
N 4035 S	EL	4L	4	4185 B	P	4092-5S	IL	7L	7	4185 C	Z
4041	D	.....	3	4185 B	R	N 4092-5S	IaL	7L	7	4185 C	Z
N 4041	} EL	} 4L	} 4	} 4185 B	} R	4093-3	} IL	} 7L	} 7	} 4185 C	} X
N 4041 S						4093-3S					
4041 F	D	.....	3	4185 B	R	4093-5	} IaL	} 7L	} 7	} 4185 C	} Z
N 4041 F	} EL	} 4L	} 4	} 4185 B	} R	4093-5S					
N 4041 FS						4094	EL	4L	4	4185 B	R
4045	} EL	} 4L	} 4	} 4185 B	} S	4095	H	.....	5	4185 B	W
4045 S						4095-1S	K	.....	8	.....	U†
4051	} EL	} 4L	} 4	} 4185 B	} T	4095-3	} GL	} 6L	} 6	} 4185 B	} W
4051 S						4095-3S					
4053-2S	FL	4L	4	4185 B	P	4095-5	} IL	} 7L	} 7	} 4185 C	} Z
N 4053-2S	EL	4L	4	4185 B	P	4095-5S					
4053-3	FL	4L	4	4185 B	R	4096	EL	4L	4	4185 B	.....
N 4053-3	EL	4L	4	4185 B	R	N 4096	JL	7L	7	4185 C	.....
4053-3F	FL	4L	4	4185 B	R	4097	N2	.....	.....	.....	AA†
N 4053-3F	EL	4L	4	4185 B	R	4097 B	} N2	}	}	}	} AA†
4053-3FS	FL	4L	4	4185 B	R	4097 C					
N 4053-3FS	EL	4L	4	4185 B	R	4097 D					
4053-3S	FL	4L	4	4185 B	R	4098	N2	.....	.....	.....	AA†
N 4053-3S	EL	4L	4	4185 B	R	4098 A	N3	.....	.....	.....	BB†
4053-5	FL	4L	4	4185 B	T	4100	D	.....	3	4185 B	R
N 4053-5	EL	4L	4	4185 B	T	N 4100 S	EL	4L	4	4185 B	R
4053-5S	FL	4L	4	4185 B	T	4100 S	D	.....	3	4185 B	R
N 4053-5S	EL	4L	4	4185 B	T	N 4100 S	EL	4L	4	4185 B	R
4055	EL	4L	4	4185 B	.....	4101	} EL	} 4L	} 4	} 4185 B	} T
4056	M2	.....	.....	.....	.....	N 4101 S					
4058	Cell.	.....	.....	.....	.....	N 4101 S					
4058 C	M1	.....	.....	.....	.....	4102	IL	7L	7	4185 C	Z
4058 W	M2	.....	.....	.....	.....	N 4102	IaL	7L	7	4185 C	Z
4088-1S	K	.....	8	.....	U†	4102 S	IL	7L	7	4185 C	Z
4088-2S	GL	6L	6	4185 B	V	N 4102 S	IaL	7L	7	4185 C	Z
4088-3	} GL	} 6L	} 6	} 4185 B	} W	4128	} IL	} 7L	} 7	} 4185 C	} Z
4088-3S						4128 S					
4088-5	IL	7L	7	4185 C	Z	4133 S	C	.....	2a	.....	P
N 4088-5	IaL	7L	7	4185 C	Z	N 4133 S	EaL	4aL	4a	4185 B	P
4088-5S	IL	7L	7	4185 C	Z	N 4135 S	K	.....	8	.....	U†
N 4088-5S	IaL	7L	7	4185 C	Z	4142	} IL	} 7L	} 7	} 4185 C	} Z
4090-3	} IL	} 7L	} 7	} 4185 C	} X	4142 S					
4090-3S						4160	} IL	} 7L	} 7	} 4185 C	} X
4091-3						4160 S					
4091-3S						4165	EL	4L	4	4185 B	R
4092-3	} IL	} 7L	} 7	} 4185 C	} X	4166	IaL	7L	7	4185 C	Z
4092-3S						4175	JL	7L	.....	4185 C	.....

*In many cases indicator glasses are listed for both the Improved and "Frameless" indicators to enable replacements to be made by those who have the "Frameless" Indicators. Where a complete indicator is needed, only the Improved one will be supplied.

†Sewed leather sheath.

†NOTE. Whenever an empty sewed leather case with space for magnifier is desired, add the letter "M" to the letter in the column headed Sewed Leather Case No., as "OM", "PM", "TM", etc,

KEUFFEL & ESSER CO., NEW YORK

GLASSES, INDICATORS, MAGNIFIERS AND CASES.

(continued)

In many cases indicator glasses are listed for both the Improved reinforced and "Frameless" indicators to enable replacements to be made by those who have the "Frameless" indicators. Where a complete indicator is needed, only the improved one will be supplied.

Indicators	Glasses Glass only	Sewed Leather Cases	
		Plain	Space For Magnifier
A, B, D.....each		O.....each	OM.....each
C....."	1, 2, 3, 4....each	U....."	PM, VM...."
EL....."	2a, 4a....."	P, V....."	RM, WM...."
EaL....."	5, 6, 8....."	R, W, X...."	XM....."
FL....."	7....."	S....."	SM....."
GL....."	4L, 4aL, 6L. "	T, Z....."	TM, ZM...."
H, K....."	7L....."	†AA....."	
IL, IaL....."		†BB....."	
JL....."			
M1....."			
M2....."			
N....."			
N2....."			
N3....."			

Where indicators are sent in to have a glass fitted, an additional charge will be made for each glass:

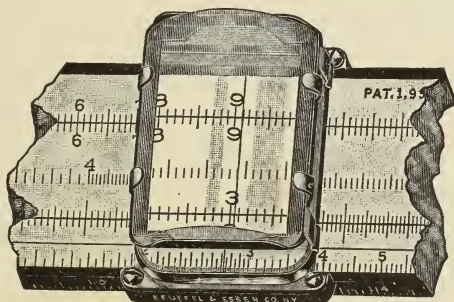
Nos. 1, 2, 2a, 3, 4, 4a.....extra,

Nos. 4L, 4aL, 6L, 7L. "

Nos. 5, 6, 7, 8..... "

Improved Glass Indicator, with two additional hairlines spaced to a stated ratio,extra each

MAGNIFIERS FOR SLIDE RULES.



No. 4185B.

The Magnifiers are mounted in a metal frame and are applied to the rule by springing them on the glass indicator. The lens is thus always in position for reading and is always in focus. The magnification is ample for even the finest graduations, the field covers the full area of the indicator, and the lines do not appear distorted. These Magnifiers cannot be used on glass indicators with two hairlines.

When ordering please indicate kind of slide rule for which the magnifier is wanted. See Table, Page 330.

4185 A. Magnifiers for Slide Rules, each - 2.50

4185 B. Magnifiers for Slide Rules, " - 2.00

4185 C. Magnifiers for Slide Rules, " - 2.75

Nos. 4185A to C are old Nos. 4085A to C.



BOOKS ON THE SLIDE RULE.

- BK 25.** **"The Use of the Slide Rule"**, a Practical Manual of Slide Rule Instruction, by Prof. Allan R. Cullimore, formerly Dean of Toledo University; 8 vo. 36 pages. Bound in cloth.....each

The following are Self-Teaching Manuals, with Tables of Settings, Equivalents and Gauge Points; prepared by competent authorities, and applying specifically to K & E Slide Rules:

- | | | |
|----------------|---|------|
| 4187 G. | "The Mannheim Slide Rule" ,..... | each |
| 4187 H. | "The Polyphase Slide Rule" ,..... | " |
| 4187 I. | "The Polyphase-Duplex Slide Rule" ,..... | " |
| 4187 J. | "The Log Log Duplex Slide Rule" , | " |
| 4187 K. | "The Log Log Vector Slide Rule" , | " |
| 4187 L. | "The Log Log Trig Slide Rule" ,..... | " |
| 4187 P. | "The Log Log Decitrig Slide Rule" ,..... | " |

Nos. 4187G to J are old Nos. 4087 G to J.

PLANIMETERS AND INTEGRATORS.

Of all mechanical devices for computation, **Planimeters** and **Integrators** rank foremost as the most ingenious and useful aids to the modern Civil, Mechanical, Mining, or Marine Engineer.

Planimeters, with the exception of the Radial Planimeter, are designed for ascertaining by a simple mechanical operation, the area of any plane surface represented by a figure drawn to any scale, such as indicator diagrams, profiles, plans, sections, etc. They are classified as **Polar Planimeters** and **Rolling Planimeters**.

The **Polar Planimeter**, invented by Prof. Amsler in 1856, consists of two principal parts, the **tracer arm** carrying the tracing point and the carriage with the measuring wheel, and the **pole arm** affixed to the pole around which the instrument revolves. The area of any figure is readily and accurately obtained by tracing its boundary line with the tracing point, whereupon the result is computed from the reading of the graduated measuring wheel and the dial which registers the number of its revolutions. As all the Polar Planimeters revolve around a fixed point, their scope is limited by the length of the arms of the instrument, which necessitates measuring large figures in sections.

Compensating Polar Planimeters Nos. N4238, 4240 and 4242 (pages 338 to 340) are distinguished by the name and trade-mark "**Paragon**," indicating that they are of the finest workmanship and precision. Every instrument thus designated is individually tested and adjusted to the highest degree of accuracy. Planimeters Nos. 4240½ and 4242½ (pages 339 and 340) are designated by the name and trade-mark "**Anvil**." These instruments have not the extreme precision of the "**Paragon**" planimeters; and they are furnished in cases lined with plain velvet.

The **Rolling Planimeter** measures, by one operation, figures of any length, and up to a width equal to the length of the tracer arm. It moves in a straight line, on broad and heavy rollers, and is especially adapted for measuring the area of profiles, deck-plans of ships, etc.

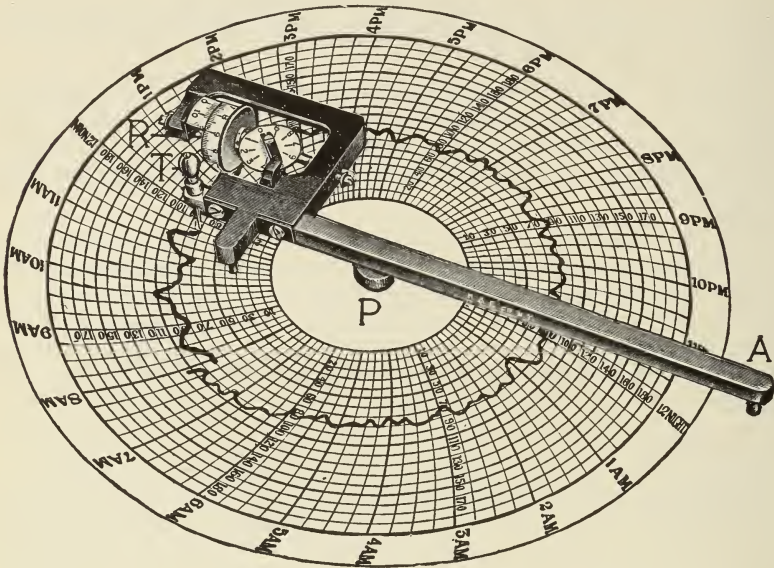
INTEGRATORS AND THE INTEGRAPH

ascertain the area and moments relative to any axis of any figure, by simply tracing its outline. They are an invaluable aid to Civil and Mechanical Engineers, Bridge Builders, Naval Architects, etc. They greatly facilitate the finding of the displacement, moments of stability and inertia, center of gravity, etc., of ships; the tensile strength, resistance, safe load, etc., of cables, tracks, beams and girders; and the contents of embankments, cuttings, etc. On the Integrators the readings are taken from recording discs. The Integraph draws automatically the integral curves, giving a graphic representation of the integration, a feature very valuable to ship builders and others, since it saves the computing of these curves.

Planimeters and Integrators are so simple, that they can be used by anybody after a little practice. They soon pay for themselves through their saving of time and labor, and give more accurate results than any other method of computation.

KEUFFEL & ESSER CO., NEW YORK

RADIAL PLANIMETER



4208. Radial Planimeter, in case, with directions each
No. 4208 is old No. 4215.

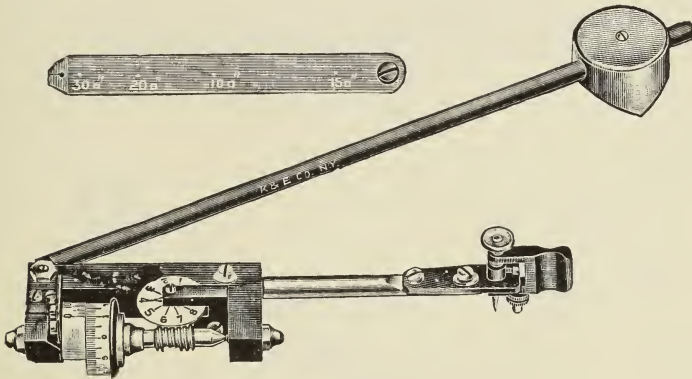
The Radial Planimeter has been designed especially for the purpose of measuring mean heights of circular diagrams with uniformly spaced ordinates.* It covers a circle $\frac{7}{8}$ to $13\frac{1}{2}$ inches in diameter, thus embracing the range of the usual disc diagrams.

Center pin P is pressed into the drawing board over the center of the diagram. The Planimeter is then mounted with the head of the center pin in the groove of the tracer arm. By this means a compulsory working of the planimeter with reference to the center of the diagram is secured. The tracer point is now brought to the starting point of the diagram and the reading of the instrument is taken. The diagram is traced clockwise until the tracer point returns to the starting point, when a second reading is taken. The difference between these readings, multiplied by the constant 0.0004, minus the radius of the base circle, gives the mean height or mean ordinate of the diagram in inches.

* Where the circular ordinates of charts are spaced in accordance with any other than the first power of the quantities which they represent—such as the square root, $\frac{3}{2}$ power, etc.—a special planimeter is required. Since the special planimeter must be designed for a specific chart, prices must necessarily be determined for each specific case

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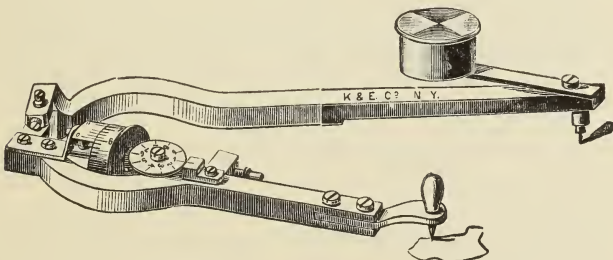
POLAR PLANIMETERS.



No. 4211.

4211. Polar Planimeter; fixed tracer arm $4\frac{3}{8}$ in. long; pole arm $6\frac{1}{2}$ in. long; combined pole and pole weight; testing rule; and table of settings for English measure, in case, with directions. Least reading, .01 of a square inch. each

Maximum Area covered	{	Pole inside:	{ Square, $14\frac{1}{2}$ in. side Circle, $20\frac{1}{4}$ in. dia.
		Pole outside:	{ Greatest square, $7\frac{1}{2} \times 7\frac{1}{2}$ in. Greatest rectangle, $14\frac{1}{2} \times 5\frac{1}{4}$ in.



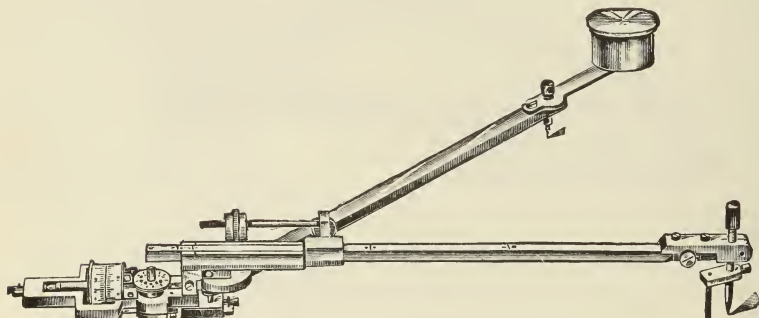
No. 4212.

4212. Polar Planimeter; fixed tracer arm 4 in. long, pole arm about $5\frac{1}{4}$ in. long, improved needle pole, with table of settings for English measure, in case, with manual. Least reading, .01 of a square inch. each

Maximum Area Covered	{	Pole inside:	None.
		Pole outside:	{ Greatest square, 7×7 in. Greatest rectangle, $12\frac{1}{2} \times 5\frac{1}{4}$ in.

Planimeters Nos. 4211 and 4212 have fixed tracer arms; and the least reading of the measuring roller vernier is .01 of a square inch. Hence, the areas of figures drawn full size may be read directly from the measuring roller by the simple operation of moving the decimal point in the result two places to the left.

POLAR PLANIMETERS.



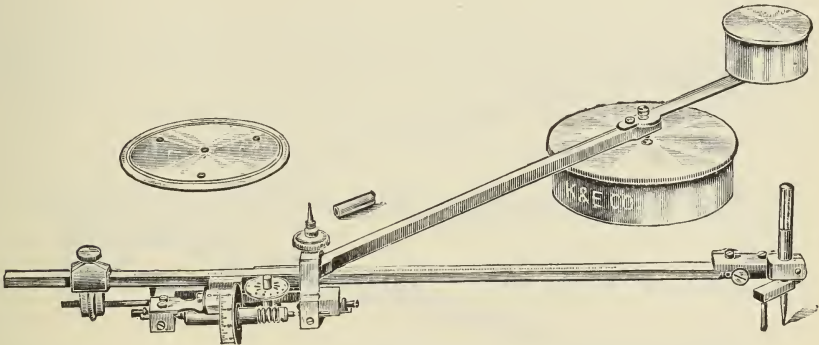
No. 4220.

- 4220. Polar Planimeter** (Amsler's pattern), nickel silver; adjustable tracer arm about $6\frac{1}{2}$ in. effective length, with 4 index marks giving settings for areas in square inches, square feet, Gunter's measure and metric; and with clamp and slow motion screw; pole arm about 6 in.; in Case, with table of settings for the English and Metric Systems, and Manual. Least reading, .01 of a square inch and 0.1 square centimeter. each

Maximum Area Covered	{	Pole inside:	None.
		Pole outside: {	Greatest square, $10\frac{1}{2} \times 10\frac{1}{2}$ in., 26×26 cm. Greatest rectangle, $16\frac{1}{2} \times 8$ in., 43×20 cm.

KEUFFEL & ESSER CO., NEW YORK

POLAR PLANIMETERS.



No. 4235.

4235. Improved Polar Planimeter, nickel silver, adjustable tracer arm about $7\frac{1}{2}$ in. effective length, fully graduated, with vernier and clamp with slow-motion screw; pole arm about 6 in. long; ball pole, pole weight and balancing weight; steel points (with nickel silver screw caps) for finding the **Mean Height of Indicator Diagrams** (as explained on page 342) with Testing Disc and table of settings for the English System; in velvet lined Case, accommodating the instrument when set to any scale, with Manual. Least reading, .01 of a square inch. . . . each

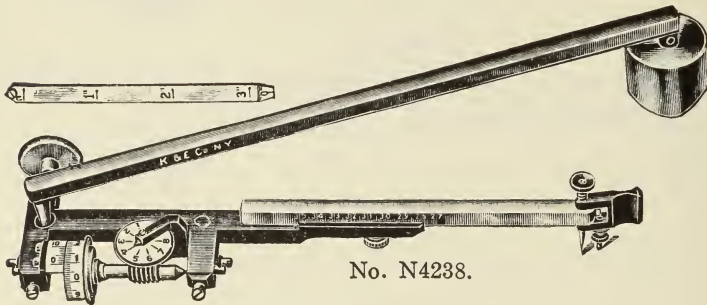
Since the tracer arm is fully graduated, very fine settings can be effected with great accuracy for any scale in the English system, and allowance can be made for the shrinkage of drawings. The tracer arm is provided with index marks for a number of scales for English measures. The Testing Disc greatly facilitates the rapid finding of these settings, serves to prove the accuracy of the instrument and is an aid in adjusting it. By shifting the pole weight, which is smooth underneath, the measuring wheel can be easily set to zero. The different parts of the instrument are adjustable and provided with set screws, so that corrections can be made for instrumental errors. The Steel Points of this instrument when not in use are protected by nickel silver caps.

Maximum Area Covered	{	Pole inside:	{ Square, $17\frac{1}{4}$ in. side. Circle, $24\frac{1}{4}$ in. dia.
		Pole outside:	{ Greatest square, $9\frac{1}{4} \times 9\frac{1}{4}$ in. Greatest rectangle, $17\frac{1}{4} \times 6\frac{1}{4}$ in.



COMPENSATING POLAR PLANIMETERS.

Compensating Planimeters are so designed that by tracing the figure with the pole on the right and on the left of the tracer arm and taking the mean of the readings, large areas can be measured with great accuracy.



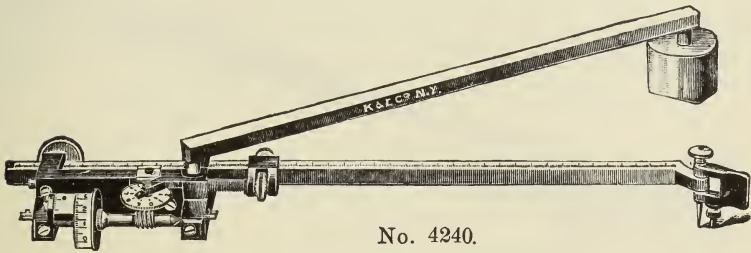
N4238. PARAGON Compensating Polar Planimeter, (see also page 333),
REG. U. S. PAT. OFF.
 nickel silver and bronzed brass, adjustable tracer arm
 about $4\frac{1}{2}$ and $6\frac{1}{2}$ in. effective length, depending on socket
 used, provided with 3 index marks; pole arm about
 $7\frac{1}{2}$ in., improved pole weight; one Testing Rule and
 table of settings for the English and Metric Systems in
 velvet-lined Case; with Manual. Least reading, .01 of
 a square inch and 0.1 square centimeter. each

Maximum Area Covered	{	Pole inside;	{ Square, $19\frac{1}{4}$ in. or 49 cm. side. Circle, $27\frac{1}{2}$ in. or 70 cm. dia.
		Pole outside;	{ Greatest square, 11×11 in. or 28×28 cm. Greatest rectangle, $19\frac{1}{4} \times 8\frac{1}{4}$ in., 49×21 cm.

Compensating Polar Planimeter No. N4238 is distinguished by the name and trade-mark **Paragon**, indicating that it is of the finest workmanship and precision. Each planimeter is individually tested and adjusted to the highest degree of accuracy.



COMPENSATING POLAR PLANIMETERS.



No. 4240.

4240. PARAGON Compensating Polar Planimeter (see also page 335)

REG. U. S. PAT. OFF.

nickel silver and bronzed brass; adjustable tracer arm about $6\frac{3}{4}$ in. effective length, fully graduated (see note under No. 4235); pole arm about $7\frac{3}{4}$ in., improved pole weight; with provision for finding the mean height of indicator diagrams; Testing Rules, and table of settings for the English and Metric Systems, in velvet lined Case accommodating the instrument, set to any scale; with Manual. Least reading, .01 of a square inch and .04 of a square centimeter each

Maximum Area Covered	{	Pole inside:	{ Square, 20 in. or 50 cm. side. Circle, 28 in. or 71 cm. dia.
		Pole outside:	{ Greatest square, $11\frac{1}{4} \times 11\frac{1}{4}$ in. or 29×29 cm. Greatest rectangle, 20×9 in. or 50×22 cm.

4240 $\frac{1}{2}$. ANVIL Compensating Polar Planimeter (see also page 335) similar

TRADE MARK

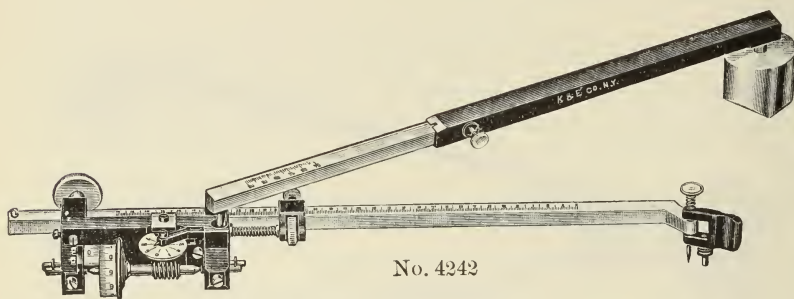
to No. 4240, but with one testing rule and table of settings for the English System only, and without provision for finding the mean height of indicator diagrams. Least reading, .01 of a square inch each

Maximum Area Covered same as for No. 4240, but for English System only.

Compensating Polar Planimeter No. 4240 is distinguished by the name and trade-mark **Paragon**, indicating that it is of the finest workmanship and precision. Each instrument is individually tested and adjusted to the highest degree of accuracy. Planimeter No. 4240 $\frac{1}{2}$ designated under the name and trade-mark **Anvil**, has not the extreme precision of the **Paragon** planimeters; and is furnished in a case lined with plain velvet.

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COMPENSATING POLAR PLANIMETERS.



No. 4242

4242. PARAGON Compensating Polar Planimeter (see also page 335)

REG. U. S. PAT. OFF.

nickel silver and bronzed brass; adjustable tracer arm about $6\frac{3}{4}$ in. effective length, fully graduated (see note under No. 4235); adjustable pole arm extending to about 13 in.; with provision for finding the mean height of indicator diagrams; Testing Rules, and tables of settings for the English and Metric Systems; in velvet lined case accomodating the instrument, set to any scale; with Manual. Least reading, .01 of a square inch and .04 of a square centimeter each

The adjustable Pole Arm bears index marks for the different settings furnished with the instrument, and can be adjusted so that when the instrument is used with the pole inside of a figure, the constant is a round number, 20,000, for any setting. The extensibility of the pole arm, and the great range of the tracer arm, permit of measuring very large figures with the pole outside. By reducing the length of the pole and tracer arms, the instrument can be used on a very small surface.

Maximum Area Covered	Pole inside:	<div> Square, $18\frac{1}{4}$ in. or 46 cm. side. Circle, 26 in. or 64.5 cm. dia. </div>
	Pole outside:	<div> Greatest square, 12×12 in. or 30×30 cm. Greatest rectangle, $27\frac{3}{4} \times 7\frac{1}{4}$ in or $69\frac{1}{2} \times 18$ cm </div>

4242 $\frac{1}{2}$. ANVIL Compensating Polar Planimeter (see also page 335) simi-

TRADE MARK

lar to No. 4242, but with one testing rule and table of settings for the English System only, and without provision for finding the mean height of indicator diagrams. Least reading, .01 of a square inch. each

Maximum Area Covered same as for No. 4242, but for English System only.

Compensating Polar Planimeter No. 4242 is distinguished by the name and trade-mark **Paragon**, indicating that it is of the finest workmanship and precision. Each planimeter is individually tested and adjusted to the highest degree of accuracy. Planimeter No. 4242 $\frac{1}{2}$, designated under the name and trade-mark **Anvil**, has not the extreme precision of **Paragon** planimeters and is furnished in a case lined with plain velvet.



SCALES FOR INDICATOR DIAGRAMS.

FOR USE WITH PLANIMETERS NOT EQUIPPED WITH DEVICE FOR FINDING
MEAN HEIGHT OF INDICATOR DIAGRAMS.



No. 4245 C.



4245 M.

4245. Flat Boxwood Scales, 4 in., one edge beveled and divided,

	A.	B.	C.	D.	E.	F.	G.	H.	J.	K.	L.
parts to inch:	10	20	40	50	60	80	100	12	24	32	64
each											

**Triangular Boxwood Indicator Scales, 3 in., six edges divided in
accordance with any of the following:**

4245-M.	graduated	10, 20, 30, 40, 50, 60	parts to in.,	. . . . .	each
4245-N.	"	20, 40, 50, 60, 80, 100	" " "	. . . . .	"
4245-O.	"	10, 15, 25, 30, 40, 70	" " "	. . . . .	"
4245-P.	"	10, 20, 25, 60, 80, 100	" " "	. . . . .	"
4245-R.	"	12, 24, 32, 64, 40, 60	" " "	. . . . .	"

Indicator Scales with other graduations made to order.

Nos. 4245A to R are old Nos. 4226A to L and 4228M to R.

TESTING DISCS AND RULES.



No. 4248.



4249.

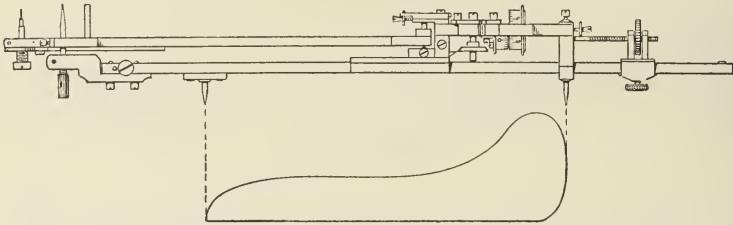
4248. Testing Disc, brass, engraved circle encloses an area of
exactly 4 square inches; with three pins to prevent
slipping. each

4249. Testing Rule, nickel silver, for radii of 1, 2 and 3 inches,
with center pin each

KEUFFEL & ESSER CO., NEW YORK

POLAR PLANIMETERS.

DEVICE FOR FINDING THE MEAN HEIGHT OF INDICATOR DIAGRAMS.



(See No. 4235.)

The mean height of an indicator diagram may be determined from the area taken with any planimeter by dividing the measured length of the diagram into the area. This calculation, however, is facilitated through the use of a simple device.

On planimeters No. 4235 (page 339) this device consists of two fine steel points, one attached to the upper side of the tracer arm, and the other to the surface of the carriage in which this arm slides.

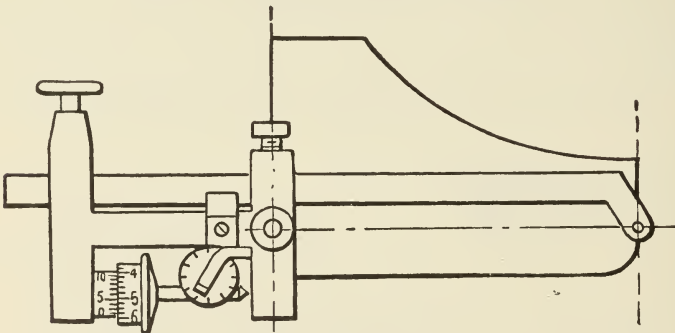
To obtain the mean height of the diagram, hold the planimeter up-side down and adjust these points so that the distance between them coincides exactly with the length of the diagram, then clamp the arm and proceed in the usual way exactly as if the area of the diagram were sought. Instead of giving, however, the area, the setting of the tracer arm is by this means such, that the difference between the readings at the beginning and end of the operation, divided by 400 or multiplied by .0025 shows the mean height of the diagram in inches.

Example : Second reading 4.786

First reading 4.322

Then $4.786 - 4.322 \div 400$ or $\times .0025 = 1.16$ inches = the mean height.

METHOD OF FINDING THE MEAN HEIGHT OF INDICATOR DIAGRAMS BY MEANS OF COMPENSATING POLAR PLANIMETERS.



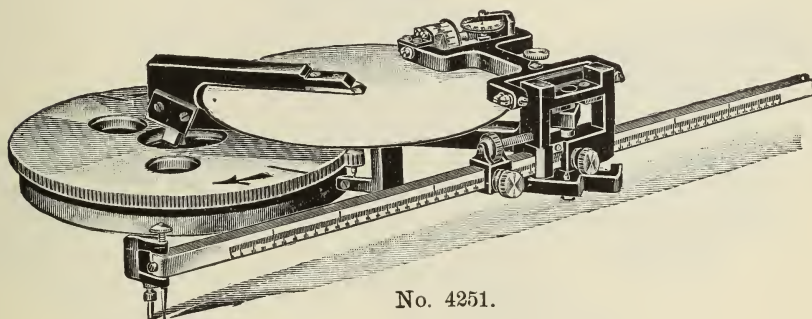
(See Nos. 4240 and 4242.)

The mean height of indicator diagrams is quickly and accurately determined by means of Nos. 4240 and 4242, since the tracer arm can be easily adjusted to the length of the base, by placing the tracer point at the right-hand end of the base, and sliding the tracer arm in its sleeve until the other end of the base becomes visible in the center of the small opening in the pole bearing, the pole arm being removed.

The reductions are made in the manner described for No. 4235 above.

KEUFFEL & ESSER CO., NEW YORK

PRECISION DISC PLANIMETER.



No. 4251.

***4251. Precision Disc-Planimeter**, nickel silver and brass, with aluminum paper-faced contact disc for the measuring wheel, latest construction, adjustable tracer arm $13\frac{3}{4}$ in. fully graduated, with micrometer adjustment. Heavy pole weight $5\frac{3}{4}$ in. diameter, contact disc for measuring wheel $5\frac{1}{2}$ in. diameter, with testing rule and table of settings for the English System; in morocco finish Case with lock and key, with Manual. Least reading, .0005 of a square inch. each

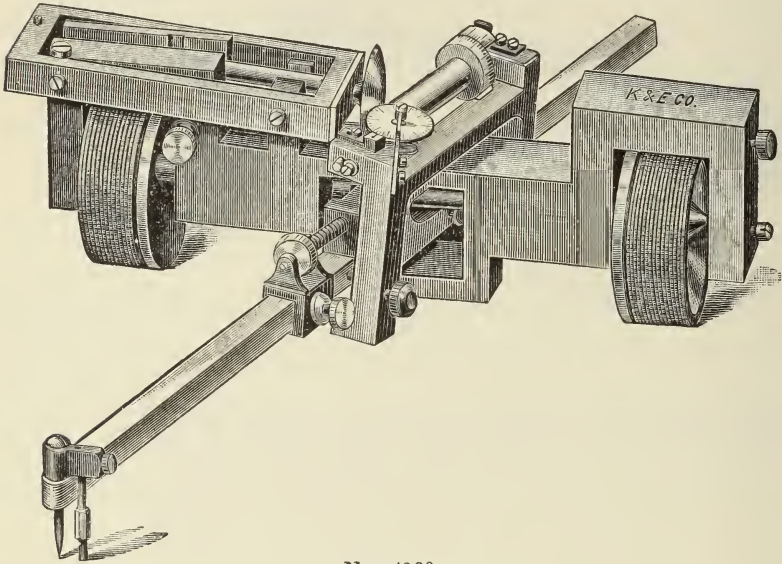
In this instrument the motion of the measuring wheel is independent of the condition of the paper on which the measured figure is drawn, as the measuring wheel revolves by contact with the plane disc. Reliable computations can be made, therefore, on plans after they have been folded or rolled. The recording mechanism is the same as on our other large planimeters.

The instrument consists of two parts, the pole weight and the planimeter proper, connected by a ball joint at the center of the pole weight. The motion of the tracer is imparted to a pivot (under the contact disc) which engages the finely toothed rim of the pole weight, transmitting rotary motion to the contact disc. The hinged carriage can be folded back to facilitate cleaning the disc. Improved tracer point with spring, a support to keep it clear of the drawing, and winged handle.

Maximum Area Covered	{	Pole inside:	{ Square, $24\frac{3}{4}$ in. side. Circle, 35 in. dia.
		Pole outside:	{ Greatest square, $11\frac{1}{2} \times 11\frac{1}{2}$ in. Greatest rectangle, $12 \times 7\frac{1}{2}$ in.

KEUFFEL & ESSER CO., NEW YORK

ROLLING PLANIMETER.



No. 4260.

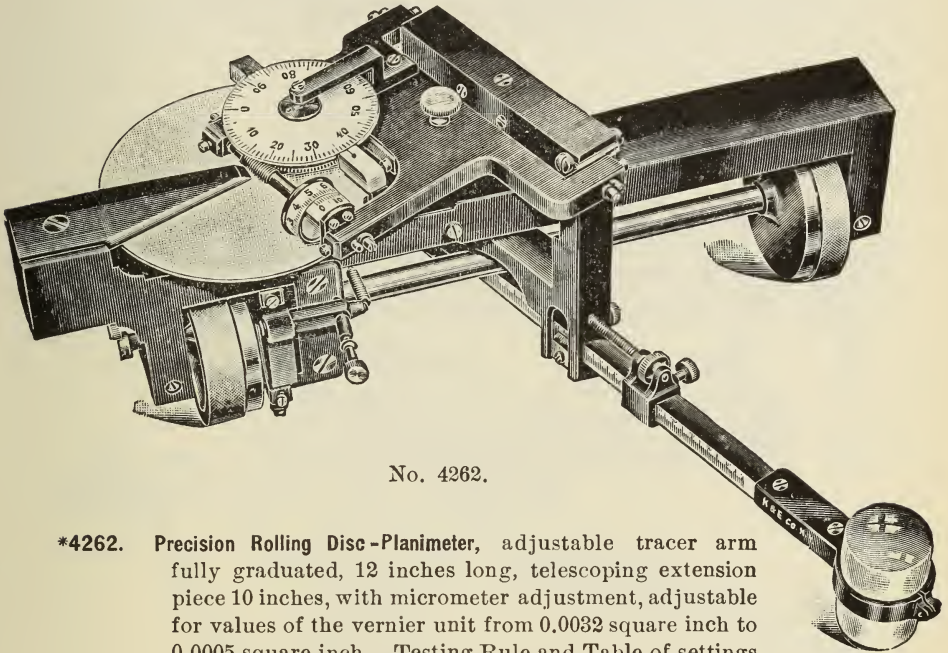
4260. Precision Rolling Sphere-Planimeter, nickel silver and brass, adjustable tracer arm fully graduated, 10 inches long, with 8-inch telescoping extension piece, Testing Rule and Table of Settings for the English system; in morocco finish Case, fitting instrument when set to any ratio, with lock and key; Manual. Least reading, .0005 of a square inch each

The Rolling Sphere Planimeter moves on two broad rollers, from one of which motion is imparted to the recording mechanism. The measuring wheel revolves by contact with a polished sphere segment. Only the rollers and the tracer are in contact with the drawing, and the results are, therefore, not affected by the surface of the paper. The area of a figure of any length, the width of which does not exceed the length of the extended tracer arm, can be measured in one operation.

Maximum Area Covered	{	Square, 17 in. side.
		Circle, 17 in. dia.
		Rectangle, 17 in. \times unlimited length.

KEUFFEL & ESSER CO., NEW YORK

ROLLING PLANIMETER.



No. 4262.

- *4262. Precision Rolling Disc-Planimeter**, adjustable tracer arm fully graduated, 12 inches long, telescoping extension piece 10 inches, with micrometer adjustment, adjustable for values of the vernier unit from 0.0032 square inch to 0.0005 square inch. Testing Rule and Table of settings for the English System; in morocco finish Case, with lock and key; with Directions. Least reading, .0005 of a square inch. each

The Rolling Disc-Planimeter is a combination of the rolling sphere planimeter and the disc polar planimeter; the integration parts (sphere and cylinder) are replaced by somewhat less intricate parts (disc and roller). The maximum area that can be measured in one operation with the rolling disc planimeter is a rectangle of any desired length, width not exceeding the length of the extended tracer arm.

The above illustration represents the instrument about $\frac{1}{2}$ actual size. The distance between the two rollers is 17 cm ($6\frac{3}{4}$ "), so that diagrams of indicators (Wattmeters, steam-gauges etc.) up to a width of 17 cm ($6\frac{3}{4}$ ") and any desired length can be measured without the rollers touching the paper. The aluminum disc, which is covered with paper, is fixed on a vertical axis, which can be easily turned between two pivots; the small toothed wheel on the axis engages automatically, i. e. elastically, in the gearing of the measuring roller, so that no obstruction or deviation from the rectilinear travelling of the running roller is caused owing to dust or other extraneous matter which may get in between the gearing. The measuring roller and its frame are similar to those of the disc polar planimeter; the gear wheel indicates up to 100 revolutions of the measuring roller. The tracer arm, its graduation, length and arrangement, and the values of the vernier units of the measuring roller are the same as in the rolling sphere planimeter. The handling is exactly the same as for that instrument.

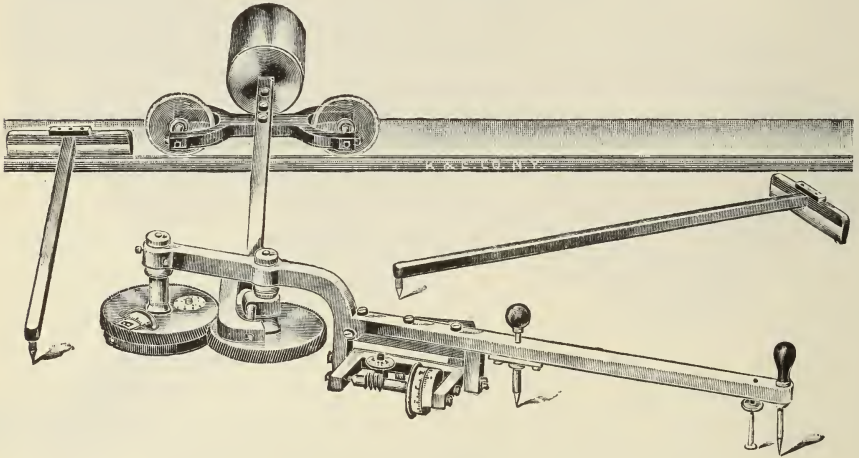
Maximum Area Covered	{	Square, $19\frac{1}{4}$ in. side.
		Circle, $19\frac{1}{4}$ in. dia.
		Rectangle, $19\frac{1}{4}$ in. \times unlimited length.

*To order only.

KEUFFEL & ESSER CO. NEW YORK

AMSLER'S MECHANICAL INTEGRATORS.

Illustration about $\frac{1}{2}$ size.



No. 4270.

4270. Amsler's Integrator, nickel silver, with **two Recording Mechanisms** giving the **Area and Moment** of any figure; two **Tracing Points**, two **Gauges** for adjusting instrument to axis of moments; **grooved Steel Rail 29 inches**; in **hard-wood Case**, with **Directions** each

***4272. Amsler's Integrator**, like No. 4270, but **Brass** “

*** This Integrator is not carried in stock, and is imported to order only.**

Integrators Nos. 4270 and 4272 give the area and moment of any figure by a simple mechanical operation. They are provided with two tracing points, for large and small figures. The one nearest to the center of rotation of the instrument effects a greater travel of the measuring wheel, consequently the area value of the wheel unit is smaller and the result more accurate. Large figures can be measured in sections. Area and moment of figures drawn to scale can be easily obtained by means of a formula furnished with each instrument.

The range of the instrument is :

Longitudinal	26 in.
Transverse	15 in.

Grooved Steel Rails of other lengths furnished to order.

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AMSLER'S MECHANICAL INTEGRATORS.

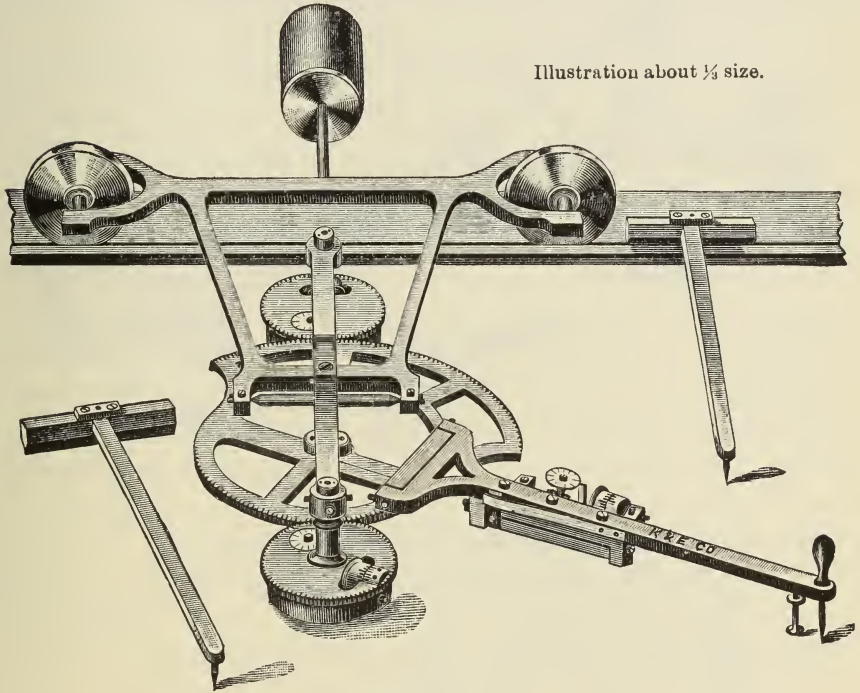


Illustration about $\frac{1}{2}$ size.

No. 4280.

4280. Amsler's Integrator, nickel silver, with three Measuring Wheels with Recording Discs giving the Area, Moment, and Moment of Inertia of any figure; two Tracing Points, two Gauges for adjusting instrument to axis of moments; instrument in hardwood Case. Grooved Steel Rail 59 in., in separate hardwood Case. With Directions . . . each

***4282.** Amsler's Integrator, like No. 4280, but Brass “

**This Integrator is not carried in stock, and is imported to order only.*

Integrators Nos. 4280 and 4282 are provided with a third train of recording wheels, which renders the moment of inertia of the figure measured.

Their range is: Longitudinal 50 inches
Transverse 13 “

***4286.** Amsler's Integrator, like No. 4280, but Extra Large, nickel silver, three Tracing Points, grooved Steel Rail 78 in., each

***4288.** Amsler's Integrator, like No. 4286, but Brass “

**This Integrator is not carried in stock, and is imported to order only.*

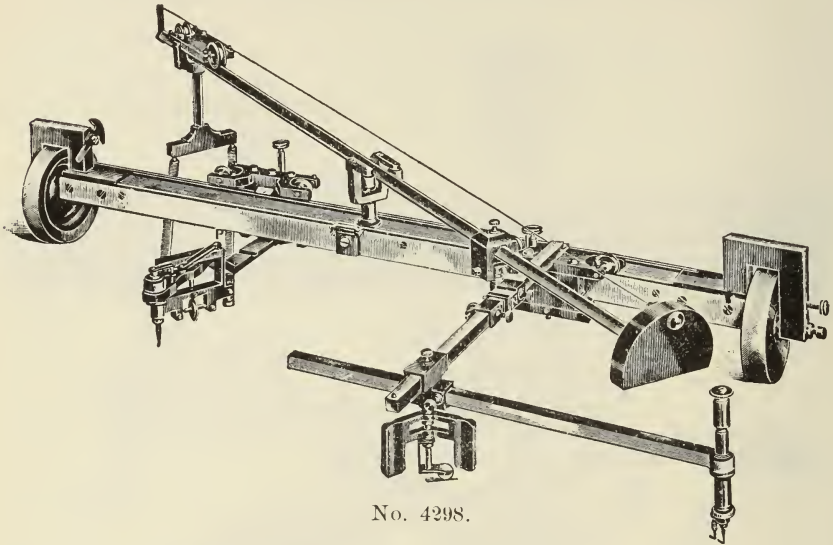
Integrators Nos. 4286 and 4288 are practically the same instruments as Nos. 4280 and 4282, but built on a larger scale, so that they measure proportionately larger figures by one operation.

Their range is: Longitudinal 67 inches
Transverse 26 “

Grooved Steel Rails of other lengths furnished to order.



CORADI'S MECHANICAL INTEGRAPH.



No. 4298.

- *4296. Coradi's Mechanical Integrator, as described under No. 4298 but lateral travel of 10.3 in., and without the device for moving the tracer point laterally. The base can be set from 1.5 to 5.2 inches.each
- *4298. Coradi's Mechanical Integrator, latest improved construction, nickel silver and brass. The instrument moves on two broad rollers. The carriages of the tracing and integrating points have a lateral travel of 21 in. The tracer arm (base rule) is graduated to $\frac{1}{10}$ inches with vernier reading to $\frac{1}{100}$ inches and micrometer screw. The base can be set from 2.5 to 8 inches. Devices for moving the tracer point laterally so as to adjust it easily on the X-axis of the figure. The arm can be taken out and the tracer point, if required, fixed also on the left side of the base. Instrument complete, with testing rule, in walnut Case, with lock and key, with Directions each

*These Integrators are not carried in stock, and are imported to order only.

Like the Mechanical Integrators, the Integrator, in a very short time comparatively, has proved to be an aid of no small consideration to Civil and Mechanical Engineers and especially Naval Architects. While it is necessary with the integrator to compute the several curves, point by point, and to construct them by means of the computed points, the integrator directly draws the curves on the paper, thus giving a graphical representation of integration. The operator traces the outline of the figure, i. e., the differential curve, and the pen or pencil point automatically draws the integral curve. The value of the ordinate of this integral curve can be measured off on the paper or read on a finely graduated bar. This value, multiplied by the constant furnished with the instrument, gives the area of the figure. By regarding the new curve as the differential curve, and tracing it in the same manner in which the first one was traced, the integral curve of the next higher order is drawn, the ordinate of which, multiplied by the constant, gives the moment of the original diagram. By repeating this operation, the moment of inertia, moments of the 4th, 5th, etc., order can be readily found. By this means practically all problems of stability, etc., may be solved almost entirely by mechanical operations, and much labor and brain work saved.



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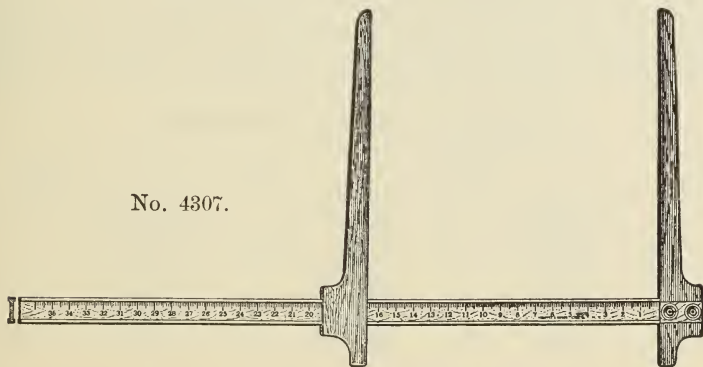
INSTRUMENTS FOR FOREST WORK.

The instruments described in the succeeding pages are designed primarily for forestry work. In addition to these, the following find frequent use:

CLINOMETERS	See pages 447 to 466.
COMPASSES, POCKET	See pages 457 and 458.
COMPASSES, SURVEYING	See pages 448 to 456.
FIELD BOOKS	See pages 82 to 91.
HAND LEVELS	See pages 461 to 465.
LUMBER CRAYONS	See page 299.
MAP MEASURES	See page 226.
SURVEYORS' CHAINS	See page 561.
TALLYING MACHINES	See page 225.
TRAVERSE TABLES	See page 445.

TREE CALIPERS.

No. 4307.



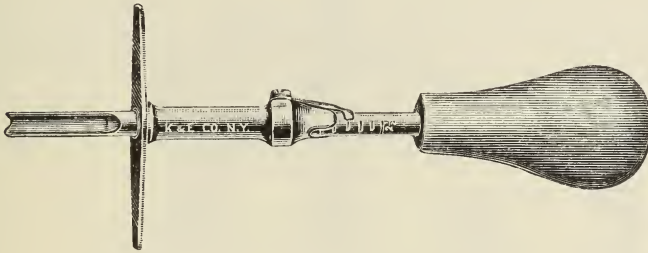
These calipers are hardwood, light natural wood finish, best workmanship, finely finished, beam graduated to 10ths inches and plainly numbered. The arms are detachable for convenience in transportation. The stationary arm is held by brass clamp nuts with lock nut. The eye of the sliding arm is brass-lined all around.

4305.	Tree Caliper,	fine quality,	hardwood,	*18 inch,	1 clamp nut,	each					
4307.	"	"	"	"	"	*34	"	2	"	"	"
4309.	"	"	"	"	"	*50	"	2	"	"	"

*This dimension refers to the largest diameter that can be measured. The bar of the caliper is actually longer than this.



SWEDISH BARK-MEASURING INSTRUMENT.



No. 4340

4340. Swedish Bark-Measuring Instrument, graduated in inches and tenths of inches each

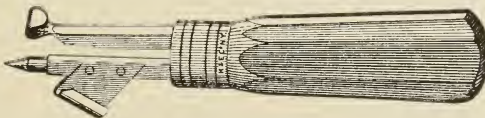
STEM ANALYSIS RULES.



No. 4348.

4348. Stem Analysis Rule, 12 in., brass, nickelplated, engine divided, one edge to 10ths inches; the other to 20ths inches with centering pin on the 10ths inches edge . each

TIMBER SCRIBE.

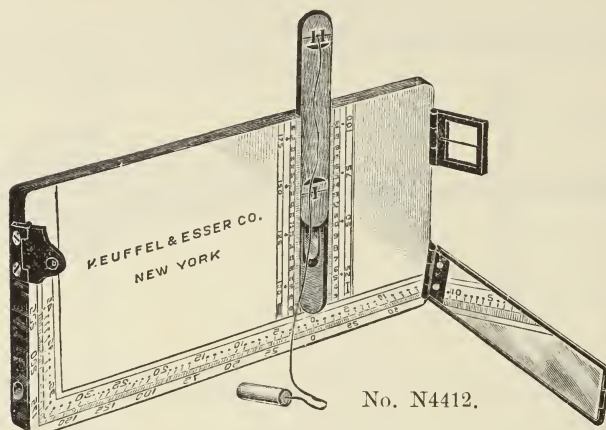


No. 4352.

4352. Timber Scribe, wooden handle, $6\frac{1}{2}$ in. each

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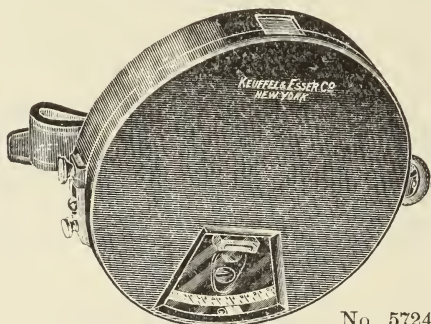
HYPSONETERS.



No. N4412.

This Hypsonometer is provided with two scales: the scale of heights on the lower edge of the instrument, and the scale of distances on the two edges of the groove in which the slide moves. The slide carries the plumb thread and has two reading lines marked I and II, corresponding to the two scales of distances also marked I and II. It is held in place by a spring. The plumb bob is stored in the end of the frame. The peep hole and hairline sights and mirror ($5\frac{1}{4} \times \frac{3}{4}$ in.) are hinged to fold down.

N4412. Hypsonometer $3\frac{1}{4} \times 7$ in. (after Faustman), polished hardwood, graduated on wood protective coating, hinged mirror mounted in aluminum, folding sights. In cloth covered pouch $3\frac{1}{2} \times 7\frac{1}{2} \times \frac{5}{8}$ in. with cover flap. With Directions, each



No. 5724.

This instrument was designed and patented by an officer of the U.S. Forest Service. The line of sight passes through the diameter of the box, from a peep sight in one side to a small glazed window in the opposite side. A segment of the cover, closed by transparent celluloid, admits light to the graduations, which are seen simultaneously with the sighted object.

5724. Hypsonometer and Gradometer as manufactured by us for the U. S. Forest Service; metal case $3\frac{5}{8} \times \frac{3}{4}$ in., sensitive gravity (pendulum) clinometer; graduated to per cent of angle, from 0 to 50% for depression and from 0 to 200% for elevation. Spring stop released by pressing knob; sliding lock for spring stop. Leather strap handle; with directions each

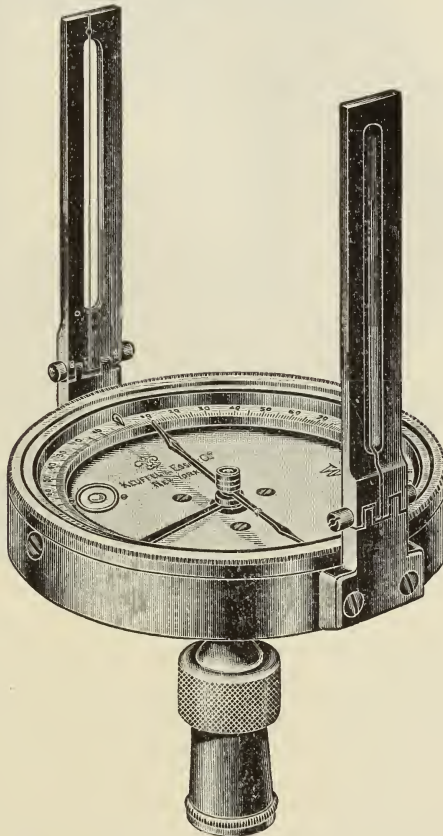


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SURVEYING COMPASSES.

In Surveying and Sighting Compasses of all descriptions the EAST and WEST lettering is REVERSED from its position on the map. This is because the needle is the fixed point while the compass box is revolved in directing the sights to the object observed. For instance, in sighting a point situated N. W. the needle will point N. E., but it will correctly READ N. W. in accordance with the line actually sighted, because the East quadrant is marked West.



No. 5330.

5330. Surveying and Timber Cruiser's Compass, with folding sights, graduated on raised ring to degrees, numbered in quadrants. VARIATION set by pinion with slotted head. CIRCULAR SPIRIT LEVEL, hermetically sealed. COMPASS GLASS beveled into screw ring. NEEDLE about 3 in., gold-plated. Complete with ball joint and socket (No. 5348-2, page 451) for mounting on Jacob Staff or Tripod; in plain leather pouch each

The compass glass is beveled into a ring which screws on the compass box. This, coupled with the fact that the governing devices for the needle stop and variation setting are designed and arranged so as to render the compass box tight, makes the entrance of moisture practically impossible.

No. 5330 fits on Jacob Staff No. 5350 and Tripods Nos. 5352, 5359 and 5360.

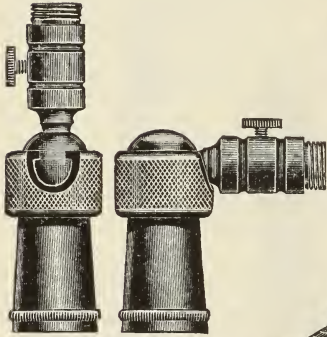
Sewed leather Sling Case in place of plain leather pouch

for compass 5330, add

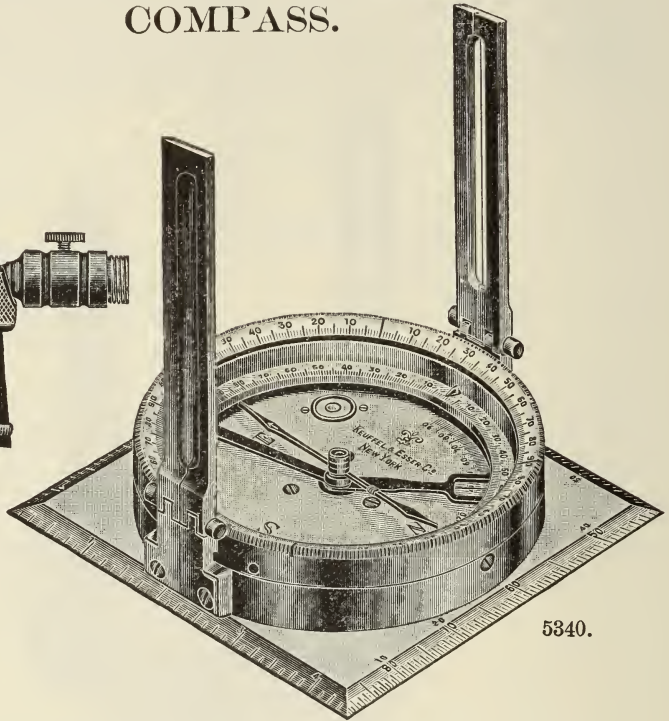
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FORESTER'S AND GEOLOGIST'S COMPASS.



No. 5348-2F.



5340.

The Forester's and Geologist's Compass is used largely in topographical work. Under the designation **Forester's Compass**, it is made by us for the **U. S. Forest Service**. It is light and portable. The variation of the needle is set off by revolving the raised compass ring by means of a slotted screw projecting through the side of the compass box. The beveled ring can be used for turning right angles or for sighting vertical angles by placing the edge of the base on a level surface. The compass glass is beveled into a ring which screws on the compass box; and the governing devices for the needle stop and variation setting are designed and arranged so as to render the compass box tight. Consequently, the entrance of moisture into the compass box is practically impossible.

5340. Forester's and Geologist's Compass, aluminum, folding brass sights. Raised compass ring graduated to degrees, **VARIATION** set by pinion with slotted head. Improved **GOLD PLATED NEEDLE** about 3 inches, with stop, jeweled center. Beveled ring on compass box, graduated to degrees and numbered in quadrants, with sighting mark at each quadrant, and knurled edge for revolving in azimuth. **PENDULUM CLINOMETER** graduated to degrees for 90 degrees in each direction. Base $4\frac{1}{2} \times 4\frac{1}{2}$ in., beveled edges; two edges graduated as a **PROTRACTOR**, one edge graduated to inches and eighths, representing chains on scale of 1 inch to 1 mile, the other edge graduated to inches and tenths. Hermetically sealed **CIRCULAR SPIRIT LEVEL** inside the compass box. **COMPASS GLASS** beveled into screw ring. Instrument complete with ball joint and socket (No. 5348-2F, page 451) for mounting on Jacob Staff No. 5350 and tripods Nos. 5352, 5359 and 5360; in sewed leather Case with shoulder strap each



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FORESTRY COMPASSES.



No. 5600.

Attention is called to the aluminum cases of the compasses, which are a great improvement over the wooden cases formerly employed. Humidity and other moisture have no effect upon the aluminum case; whereas no means has yet been devised to keep the wooden case from warping out of shape, with the consequent loosening of the glass and the rusting of the needle and its pivot.

Each instrument is furnished with eyes on the edges, through which a cord can be attached for suspending the compass from the neck of the user. This leaves both hands free when notes are to be entered.

These compasses are arranged so that the declination of the needle can be set off.

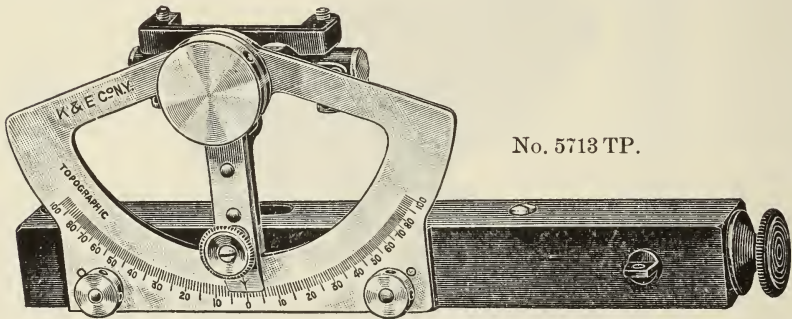
- 5600.** Forestry Compass, needle 2 in., with jeweled center and automatic stop, graduated on raised metal ring to degrees, numbered 0 to 360; aluminum case, with black hardened surface, with sighting line on lid. each
- 5600 C.** Forestry Compass, like No. 5600, but with Clinometer reading to 1° from 0 to 90 degrees in both directions each
- 5600 X.** Forestry Compass, like No. 5600, but numbered in quadrants . . . “
- 5600½.** Forestry Compass, like No. 5600, but needle 2½ in., numbered 0 to 360 “
- 5600½ X.** Forestry Compass, like No. 5600½, but numbered in quadrants . . . “



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TOPOGRAPHIC ABNEY LEVEL



No. 5713 TP.

The **K & E Topographic Abney Level**, as made by us for the U. S. Forest Service, is an improved form of Abney level, with draw to eye piece. Its length is $6\frac{1}{4}$ in., extending to $7\frac{3}{8}$ in. The bubble tube is large and has adjustment devices similar to those on the bubble tubes of a transit. The long sighting tube and larger bubble lessen the strain upon the eye, and give greater steadiness to the instrument. The radius of the graduated limb is $1\frac{3}{4}$ in., or about 75 per cent greater than that of the ordinary Abney level. The wide spaces between the graduations make unnecessary the use of a vernier—a point which often appeals to the non-technical user.

5713PD. Topographic Abney Level, arc in per cent of grade on one side of limb, degrees on other side; in sewed leather case with belt loop, each

5713TP. Topographic Abney level, arc in per cent of grade on one side of limb, topographic arc on other side; in sewed leather case with belt loop, each

The graduations on the Topographic Arc indicate the difference in elevation in feet for one chain (66 ft.) of horizontal distance. When used in conjunction with the Topographic Tapes Nos. 7697-2 to 7697-5 described on page 357, the labor of chaining is much expedited in steep and broken country.

Limbs only with PD or TP graduations each



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TOPOGRAPHIC TAPES



Graduations -- Topographic Tape

The Topographic Tapes, when used in conjunction with the Topographic Abney Level, (see page 356) expedite the labor of chaining in steep and broken country.

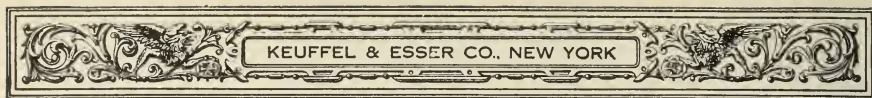
7697-2. Topographic Trailer Tape, $\frac{1}{4}$ in. wide, 2 chains (132 feet) with trailer of about 33 feet long. Etched graduations. One side graduated every link for the first two chains, with brass sleeves at the zero, one chain and two chain marks. Beyond the two chain mark is a trailer with graduations proportionated to the graduations of the Topographic Arc. For very steep slopes, the reverse side of the tape is graduated every link for one chain, with a long trailer graduated as described above. each

In using the Topographic Arc and the Trailer Tape, take a slope reading on the Arc, and with the Trailer Tape measure on the slope two chains and as many graduations on the trailer as the Arc reading shows. This distance measured on the slope equals a horizontal distance of two chains. If the same procedure is carried out with the reverse face of the tape, it will give the equivalent location of one chain's distance measured horizontally.

7697-3. Topographic Tape, $\frac{1}{4}$ in. wide, 3 chains (198 feet) long. Etched graduations. One side graduated every link for 3 chains. On the reverse face, behind the 50 link, 1 chain and 2 chain marks, are series of graduations proportionated to the graduations of the Topographic Arc. These graduations are finer than those on No. 7697-2, thus admitting of finer and more accurate work. The method of employing this tape is substantially the same as that described under No. 7697-2. . . . each

7697-5. Topographic Tape, $\frac{1}{8}$ in. wide, 5 chains (330 feet) long. Etched graduations every link, with correction graduations on reverse face as described under No. 7697-3 but behind the 50 link, and 1, 2, 3 and 4 chain marks. each

Nos. 7697-2 to -5 are old Nos. 5713-2 to -5.



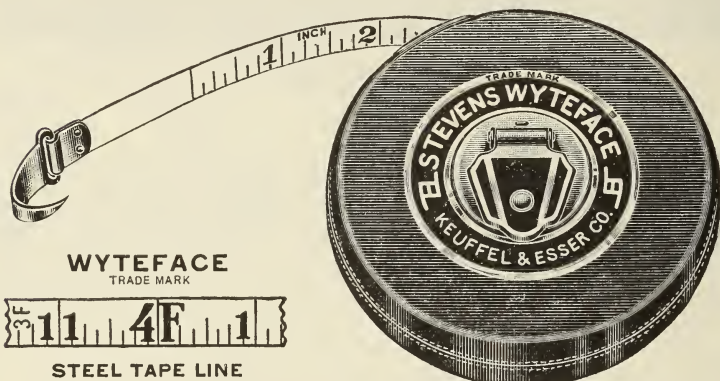
K & E WYTEFACE STEEL TAPES.

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TRADE MARK

DIAMETER (TREE) TAPES

(FORESTER'S TAPES)



WYTEFACE
TRADE MARK



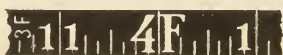
STEEL TAPE LINE

W7356. STEVENS WYTEFACE Steel Diameter (Tree) Tape, $\frac{3}{8}$ in. wide, 20 feet; one side in feet, 10ths and 100ths of a foot, other side graduated to give diameter in inches and 10ths of an inch consecutively up to 76 inches direct from a circumference measurement; stout bent black leather case, long folding self-opening handle. **Patented friction brake.** Chromium-plated mountings. Hinged end hook for fastening to tree, which fits in orifice in edge of case when not in use. Graduations begin **on the line.**

W7357. STEVENS WYTEFACE Steel Diameter (Tree) Tape, as described under No. W7356, but 50 feet long, and with reverse side graduated to give diameter in feet, inches and 10ths of an inch direct from a circumference measurement.

W7358. STEVENS WYTEFACE Steel Diameter (Tree) Tape as described under No. W7356, but 50 feet long; and one side graduated in feet, inches and 8ths of an inch, other side graduated to give diameters in feet, inches, and 64ths of an inch direct from a circumference measurement. The diameter equivalents of 64ths of an inch are given in an extra diameter inch before zero.

For other diameter tapes, see page 525.

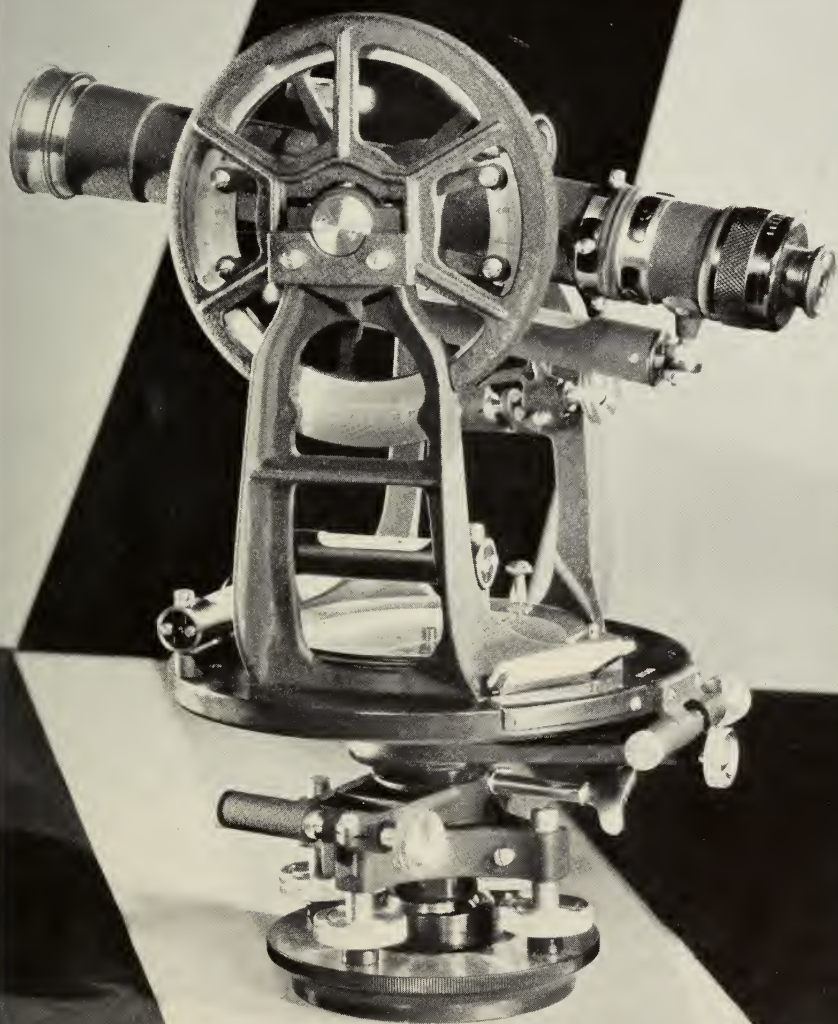



KECO BLACK FINISH TAPES, $\frac{3}{8}$ in. wide. with etched graduations and brown leather case embossed "HOME" will be furnished if so ordered.



K & E

SURVEYING INSTRUMENTS




 KEUFFEL & ESSER CO., NEW YORK

K & E

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ENGINEERS' SURVEYING INSTRUMENTS.

All K & E and Y & S Surveying Instruments are made in our Factory at Hoboken, New Jersey, U. S. A.

Our instruments, from castings to optics, are made entirely in this factory. The lenses themselves are designed in our optical laboratory, and ground and polished, under rigid inspection, in our own optical department. **The fact that we design and construct optical systems for periscopes, range finders, and similar high class instruments for the United States Government is a sufficient commentary on the excellence of our work.** It may also be said that improvements incorporated in our Instruments are not found in any others; for all of which reasons we feel no hesitation in claiming that, in every respect—design, construction, material, workmanship and precision—K & E Surveying Instruments are unexcelled. This claim is supported by our unqualified guarantee of satisfactory service to every user of a K & E Surveying Instrument.

SPECIAL INSTRUMENTS

The surveying instruments listed in this catalogue represent designs which the experience of the American engineer have proven to be best fitted for all general purposes; but we are prepared to add any special features, or to make changes which individual purchasers may desire. Extra accessories and attachments are listed on pages 412 and 414.

We take this opportunity to thank our friends in the engineering profession for their constructive criticisms and suggestions, which have been of material benefit in the development of K & E Surveying Instruments to their present high state of perfection.

NOTE: Instruments listed in this Catalogue with Tripods Nos. 5178 and 5180 can be furnished on order, at no extra charge, with tripod plate and tripod head having a thread $3\frac{1}{2}$ in. in diameter, 8 threads to the inch, in accordance with the recommendations of the Division of Simplified Practice, Bureau of Standards, U. S. Department of Commerce. Tripods with heads having this thread are regularly carried under Nos. 5178-8 and 5180-8.

SYNOPSIS OF LEVELS & ALIDADES.

Page No.	Catalogue Number	Type	Telescope		†Sensitivity of Spirit Level	Number of Leveling Screws	†Weight	
			†Length	*Effective Aperture			Instrument	Tripod
		Eye-piece			†Magnification			
367	†5003F	Dumpy	18	1.60	32×	4	10	10 to 11
369	†5010F	Wye	18	1.60	32×	4	12	do.
369	5012F	do.	20	1.75	38×	4	14	do.
371	†5018F	do.	18	1.60	32×	4	13	do.
373	5024	Precise	14	1.60	40×	4	8	do.
375	5026	do.	14	1.60	40×	3	9	16
377	N5027	do.	17	1.65	32×43×	3	14½	16
416	Y5118	Dumpy	12	1.38	24×	4	6½	7
416	Y5119	do.	13½	1.30	24×	4	6½	7
417	Y5120	Wye	18	1.38	28×	4	10½	10 to 11
439	5187A	Alidade	10	1.36	16×	—	6½	—
442	5189A	Alidade	9½	1.14	14×	—	4½	—

*The area of the effective aperture is a measure of the light transmitting power—the area of the objective is not. Some telescopes have large objectives and comparatively small effective apertures; thus adding weight without serving any good purpose.

†Can be furnished with inverting telescope upon order only.

‡Approximate.

aChambered.

SYNOPSIS OF TRANSITS AND THEODOLITES.

Page No.	Catalogue No.	TELESCOPE				Compass Needle, Length	† SENSI- BILITY		Leveling Screws	HORIZONTAL LIMB		VERTICAL LIMB			† WEIGHT	
		Eye-piece	† Length	† Effective Aperture	† Power		Telescope Level	Plate Levels		Diameter	Reads to	Stadia Circle	Vertical Circle	Vertical Arc	Instru- ment	Tripod
379	5040F	Erect.	11½	1.36	24	4½	30	70	4	6½	1 min.	in.	in.	in.	lb.	lb.
379	*5040FR	Invert.	12	1.44	28	"	"	"	"	"	"	—	—	—	15	10-11
381	*5050F	Erect.	11½	1.36	24	"	"	"	"	"	"	—	—	5	15½	"
381	*5050FR	Invert.	12	1.44	28	"	"	"	"	"	"	—	—	"	15½	"
381	5060F	Erect.	11½	1.36	24	"	"	"	"	"	"	—	5	—	15½	"
381	*5060FR	Invert.	12	1.44	28	"	"	"	"	"	"	—	"	—	15½	"
383	5060FS	Erect.	11½	1.36	24	"	"	"	"	"	"	5	—	—	16	"
383	*5060FRS	Invert.	12	1.44	28	"	"	"	"	"	"	"	—	—	16	"
385	5070F	"	9½	1.36	22	3¾	"	75	3	5½	20 sec.	—	4½	—	12	14
385	5070FS	"	"	"	"	"	"	"	"	"	"	4½	—	—	"	"
385	5071F	"	"	"	"	"	"	"	"	"	30 sec.	—	4½	—	12	"
385	5071FS	"	"	"	"	"	"	"	"	"	"	4½	—	—	"	"
387	*5074F	Erect.	10	1.29	20	"	"	"	4	"	1 min.	—	—	4½	13	10-11
387	5076F	"	"	"	"	"	"	"	"	"	"	—	4½	—	"	"
387	5076FS	"	"	"	"	"	"	"	"	"	"	4½	—	—	"	"
389	5076½F	"	"	"	"	"	"	"	"	"	"	—	4½	—	15	"
391	5077F	"	9½	1.14	17	3½	"	80	"	4¾	"	—	4	—	10	9½
391	5077FS	"	"	"	"	"	"	"	"	"	"	4	—	—	"	"
393	5079F	Invert.	6½	1.06	14	2¾	35	90	"	4	"	—	3¾	—	5½	4
393	5079FS	"	"	"	"	"	"	"	"	"	"	3½	—	—	"	"
395	5081CF	Erect.	10	1.29	20	3	30	75	"	5½	"	—	4½	—	13½	10-11
395	5081CFS	"	"	"	"	"	"	"	"	"	"	4½	—	—	"	"
397	5081½CF	"	"	"	"	"	"	"	"	"	"	—	4½	—	15½	"
399	5082F	"	11½	1.36	24	—	"	70	"	6½	"	—	—	—	16	"
399	*5084F	"	"	"	"	—	"	"	"	"	"	—	—	5	16	"
399	5085F	"	"	"	"	—	"	"	"	"	"	—	5	—	16	"
401	5082CF	"	"	"	"	3¾	"	"	"	"	"	—	—	—	16	"
401	5082CFR	Invert.	12	1.44	28	"	"	"	"	"	"	—	—	—	"	"
401	*5084CF	Erect.	11½	1.36	24	"	"	"	"	"	"	—	—	5	16	"
401	*5084CFR	Invert.	12	1.44	28	"	"	"	"	"	"	—	—	"	16½	"
403	5085CF	Erect.	11½	1.36	24	"	"	"	"	"	"	—	5	—	"	"
403	*5085CFR	Invert.	12	1.44	28	"	"	"	"	"	"	—	"	—	"	"
403	5085CFS	Erect.	11½	1.36	24	"	"	"	"	"	"	5	—	—	"	"
403	*5085CFRS	Invert.	12	1.44	28	"	"	"	"	"	"	"	—	—	"	"
405	*5086P	Invert.	12	1.44	28	—	20	50	3	7	10 sec.	—	—	—	18½	14
405	5086V	"	"	"	"	—	"	"	"	"	"	—	5	—	19	"
407	5088	"	13½	1.60	24	—	—	40	"	8	"	—	5½	—	23	"
409	N5089	"	13	1.90	25	—	8	12	"	6½	5 sec.	—	5½	—	22	"
419	Y5160	Erect.	11½	1.22	24	4½	40	80	4	6½	1 min.	—	5	—	14½	10-11
419	Y5160S	"	"	"	"	"	"	"	"	"	"	5	—	—	"	"
419	Y5165	"	9	1.06	18	3⅝	"	"	"	5½	"	—	4	—	11½	"
419	Y5165S	"	"	"	"	"	"	"	"	"	"	4	—	—	"	"
421	Y5166	"	9	"	"	3½	60	100	"	5	"	—	4	—	9½	9½
421	Y5166S	"	"	"	"	"	"	"	"	"	"	4	—	—	"	"

*Made to order only.

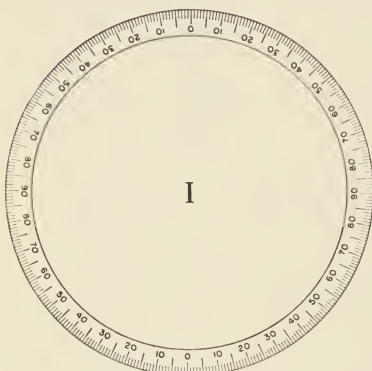
†The area of the effective aperture is a measure of light transmitting power—the area of the objective is not. Some telescopes have large objectives and comparatively small effective apertures; thus adding weight without serving any good purpose.

‡Approximate.

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NUMBERING OF GRADUATIONS.

The following illustrations show some of the various methods of numbering the graduations of the horizontal and vertical limbs of transits. Unless other methods of numbering are specified in the order, K. & E. transits are furnished with the horizontal limb showing two rows of numbers in opposite directions, from 0 to 360° as in cut IV, and the vertical circle numbered in quadrants as in cut I.



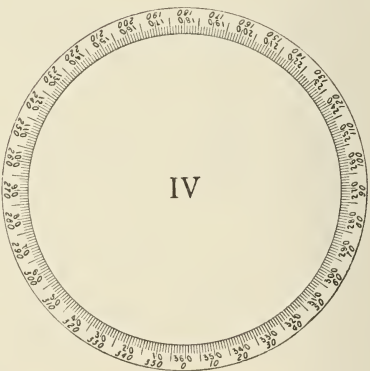
Vertical Circle,
numbered in quadrants.



Horizontal Limb
numbered 0—360.



Horizontal Limb,
numbered 0—360,
and in quadrants.

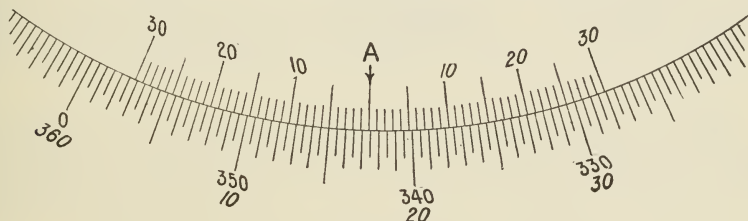


Horizontal Limb,
numbered 0—360,
and 360—0.

GRADUATION.

The Limbs of Transits are graduated in various ways. The ordinary transit is usually graduated to read to single minutes, but instruments reading to 30, 20, 10 and 5 seconds are listed in this catalogue. Graduations to decimals of a degree (10ths, 50ths, 100ths or 200ths) and centesimal graduations (100 parts, grades, to the quadrant) are furnished to order. The usual styles of graduation and the method of numbering the horizontal limb are shown below.

GRADUATED 30 MINUTES READING TO ONE MINUTE.

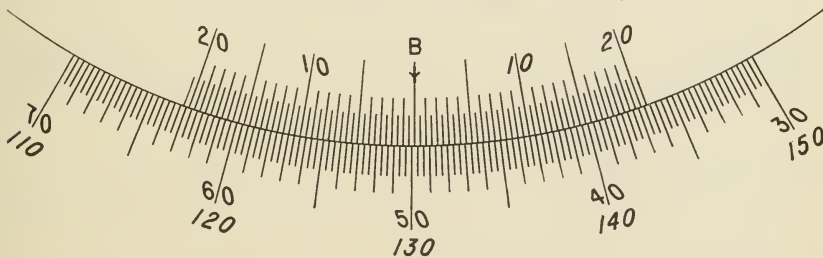


Style B.

Style B represents the usual graduation of the horizontal limb of an Engineer's Transit with its vernier. This is an ordinary **double-direct vernier**, reading from the center, to either extreme division (30). The limb is graduated to half degrees, and the vernier (from 0 to 30) comprises 30 divisions; therefore, the reading of the vernier is $30 \text{ minutes} \div 30 = 1 \text{ minute}$.

The figure reads $17^\circ + 25' = 17^\circ 25'$ from left to right, and $342^\circ 30' + 05' = 342^\circ 35'$ from right to left.

GRADUATED 20 MINUTES READING TO 30 SECONDS.



Style C.

(See No. 5097-70, page 414.)

Style C represents the graduation and vernier of an Engineer's Transit having finer divisions than style B. This is also a **double-direct vernier**, reading from the center to either extreme division (20). The limb is graduated to 20 minutes and there are 40 divisions in the vernier; consequently, the reading of the vernier is $1200 \text{ seconds} \div 40 = 30 \text{ seconds}$.

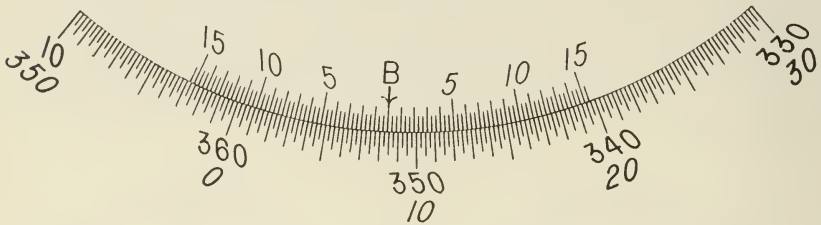
The figure reads $130^\circ 00' + 9' 30'' = 130^\circ 9' 30''$ from left to right, and $49^\circ 40' + 10' 30'' = 49^\circ 50' 30''$ from right to left.



GRADUATION (continued)

GRADUATED TO 15 MINUTES READING TO 20 SECONDS.

DOUBLE DIRECT VERNIER.



Style F.

(See No. 5097-71A, page 414).

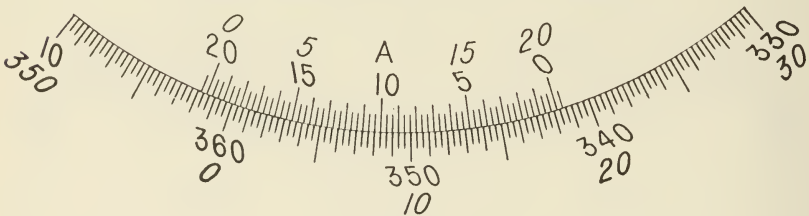
Style F represents the graduation of the horizontal limb and vernier of an Engineer's Transit having somewhat finer divisions than style C. This is a **double direct vernier** reading from the center to either extreme division (45). The limb is graduated to 15 minutes and there are 45 divisions in the vernier. Consequently the reading of vernier is $900 \text{ seconds} \div 45 = 20 \text{ seconds}$.

The figure reads $351^\circ 30' + 5' 40'' = 351^\circ 35' 40''$ from left to right and $8^\circ 15' + 9' 20'' = 8^\circ 24' 20''$ from right to left.

Since this graduation requires no shifting of the vernier when changing from a left hand to a right deflection, and vice versa, it will be furnished unless style G is specified.

GRADUATED TO 20 MINUTES READING TO 20 SECONDS.

SINGLE VERNIERS, TWO ROWS OF NUMBERS



Style G.

(See No. 5097-71B, page 414).

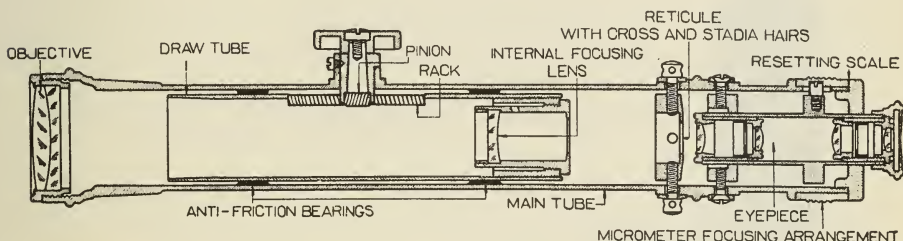
Style G represents the graduation of the horizontal limb and vernier of an Engineer's Transit with more open divisions than Style F. This is a **single direct vernier** reading from either end to the opposite extreme division (60). The limb is graduated to 20 minutes and there are 60 divisions in the vernier. Consequently the reading of the vernier is $1200 \text{ seconds} \div 60 = 20 \text{ seconds}$.

The figures read $341^\circ 40' + 9' 20'' = 341^\circ 49' 20''$ from left to right and $358^\circ 20' + 10^\circ 40' = 358^\circ 30' 40''$ from right to left.



K & E
REG. U. S. PAT. OFF.

INTERNAL FOCUSING TELESCOPE



The insistent demands of many Engineers and Surveyors for a dust and moisture-proof telescope led us to design and construct the K & E INTERNAL FOCUSING TELESCOPE.

In a telescope of the usual type, however well designed and fitted, the possibility always exists that very fine dust or grit may enter between the draw and bearings and cause the draw to fret and stick.

The K & E INTERNAL FOCUSING TELESCOPE permits the main tube to be in one piece, closed at one end by the objective and at the other end by the eyepiece, as shown above; thus making it practically dust and moisture-proof. Focusing is performed by means of the pinion, which moves the draw tube with its internal focusing lens. The draw is accurately fitted into the tube bearings, and will retain its perfect fit.

The K & E INTERNAL FOCUSING TELESCOPE remains in better balance than a telescope of the usual type when focused at any distance, because the moving parts are near the center of the telescope.

Optically, the K & E INTERNAL FOCUSING TELESCOPE has excellent definition and the field is exceptionally flat. The effective aperture is comparatively large, giving a brilliant image.

The K & E INTERNAL FOCUSING TELESCOPE as used on TRANSITS and PLANE TABLE ALIDADES, refers all stadia observations directly to the center of the instrument, the usual instrument constant ($f+c$) being negligible. This feature saves time and assures greater accuracy.

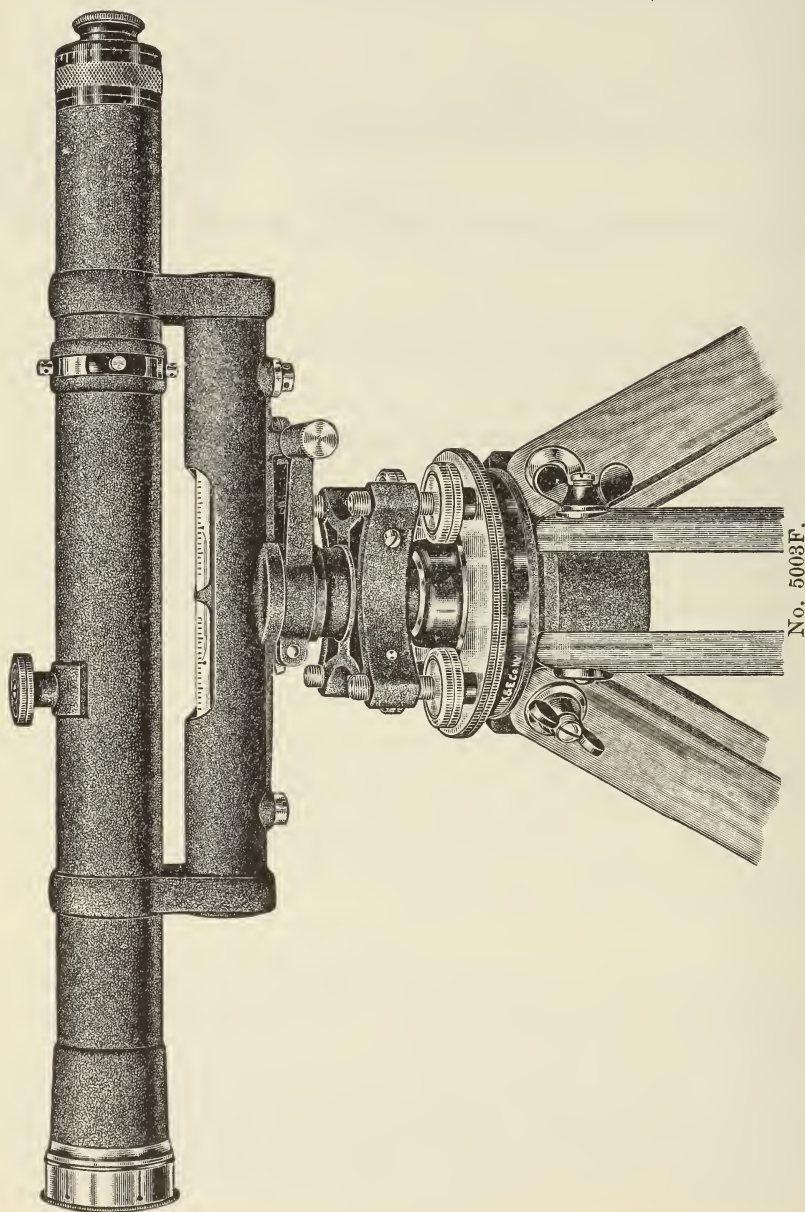
Since the introduction of the K & E Internal Focusing Telescope, K & E Co. have installed this feature on all high grade instruments; and have heard it universally praised by a large number of users, including the U. S. Coast and Geodetic Survey, U. S. Geological Survey, and other Government agencies.

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K & E

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ENGINEER'S DUMPY LEVEL.



No. 5003F.



K & E

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ENGINEER'S DUMPY LEVEL.

(For Synopsis of Levels, see page 360).

(See also illustration on page 366).

(For Internal Focusing Telescope, see page 365).

5003F. **K & E ENGINEER'S DUMPY LEVEL, with INTERNAL FOCUSING TELESCOPE.**

Telescope 18 in., achromatic terrestrial. **OBJECT GLASS** $1\frac{1}{2}$ in. (effective aperture 1.60 in.). **INTERNAL DRAWTUBE**, focused by improved spiral toothed rack and pinion movement. **EYE-PIECE**, erecting, adjustable, with improved micrometer focusing arrangement with resetting scale. **MAGNIFYING POWER** 32 diameters.

Level Bar tubular in form, very strong, encasing fine spirit level. **LEVEL VIAL** graduated on the glass and ground to a sensitiveness of about 20 seconds of arc per graduation (2mm). Improved adjusting device for level vial. Very stout supports to telescope.

Center of bronze, precisely fitted. Center and Level Bar are cast in one piece. Improved **CLAMP** and **TANGENT SCREW** with counterspring. Tangent, Clamp and Leveling Screws of nickel silver. Four leveling screws.

Morocco Finish.

Instrument complete, with sunshade, adjusting pins, center key and waterproof cover, in fine polished mahogany Case and with No. 5178 Split Tripod. each

Weight of instrument about 10 lbs. **Weight** of tripod about 10 to 11 lbs.

This instrument can be furnished with a 16 inch inverting telescope, magnifying power $28\times$, upon order. Price quoted upon request.

Extension Tripod No. 5180 (see page 438) furnished in place of 5178 at additional charge. each

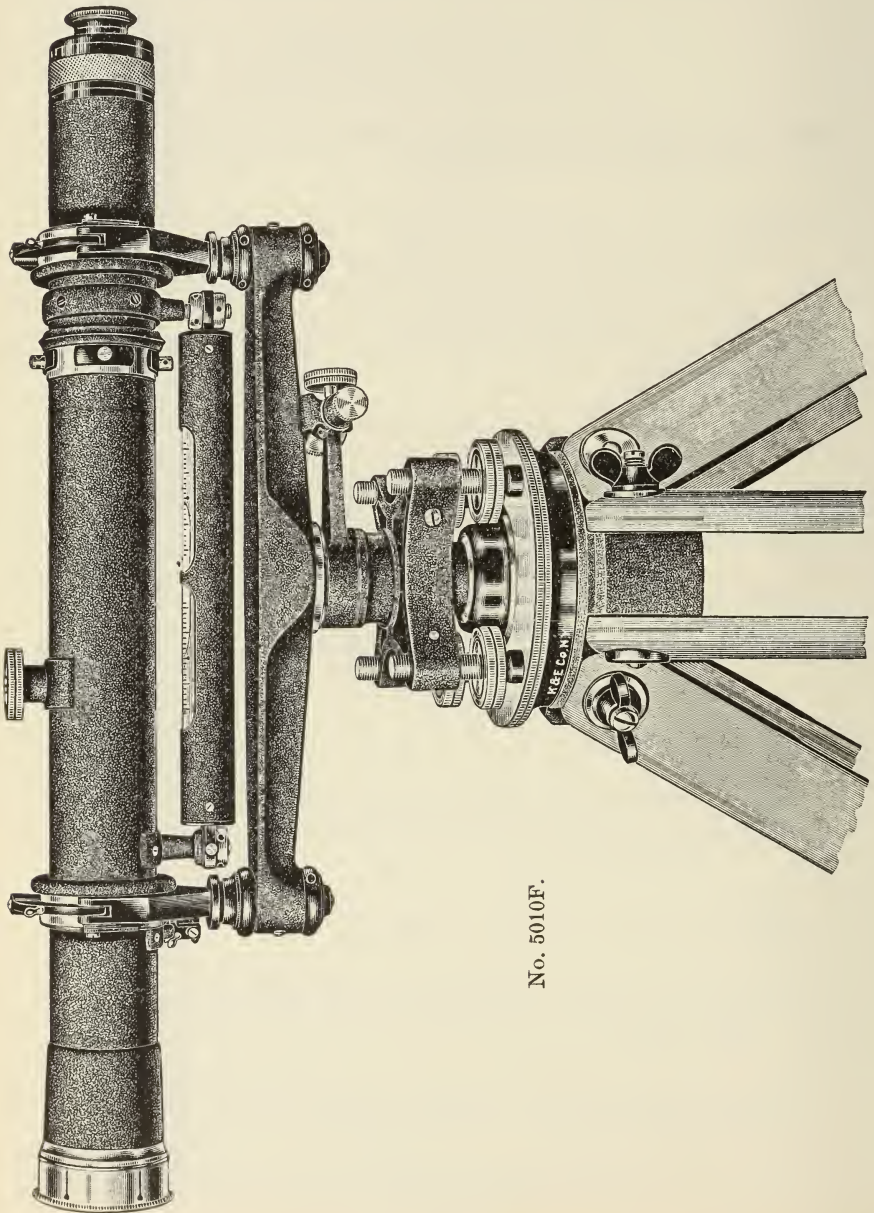
For other Dumpy Levels, see pages 416, 417 and 423.

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K & E

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ENGINEER'S Y LEVEL.



No. 5010F.



K & E

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ENGINEER'S Y LEVELS.

(For Synopsis of Levels, see page 360.)

(See also illustration on page 368.)

(For Internal Focusing Telescope, see page 365.)

5010F. K & E ENGINEER'S Y LEVEL, with INTERNAL FOCUS- ING TELESCOPE.

Telescope 18 in., achromatic terrestrial. OBJECT GLASS $1\frac{5}{8}$ in. (effective aperture 1.60 in.). INTERNAL DRAWTUBE, focused by improved spiral toothed rack and pinion movement. EYEPIECE, erecting, adjustable, with improved micrometer focusing arrangement with resetting scale. MAGNIFYING POWER 32 diameters. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 20 seconds of arc per graduation (2mm). Level tube adjustable vertically and horizontally.

Level Bar of gun metal, improved construction, of great strength and rigidity, shaped to offer least resistance to the wind. One Y can be raised or lowered and is provided with an ADJUSTABLE HINGED STOP for placing the telescope with the cross hairs in a vertical and horizontal position. The Y's are locked by an improved arrangement dispensing with pinbolts.

Center of bronze, precisely fitted. Improved CLAMP and TANGENT SCREW with counterspring. Tangent, Clamp and Leveling Screws of nickel silver. Four leveling screws.

Morocco Finish.

Instrument complete with sunshade, adjusting pins, center key and waterproof cover, in fine polished mahogany Case and with No. 5178 Split Tripod. each

Weight of instrument about 12 lbs.

Weight of tripod about 10 to 11 lbs.

5012F. K & E ENGINEER'S Y LEVEL, INTERNAL FOCUSING, like No. 5010F, but **telescope** 20 in., **object glass** $1\frac{3}{4}$ in. (effective aperture 1.75 in.), MAGNIFYING POWER 38 diameters. With No. 5178 Split Tripod. each

Weight of instrument about 14 lbs. **Weight** of tripod about 10 to 11 lbs.

5005F. K & E ENGINEER'S Y LEVEL, INTERNAL FOCUSING, like No. 5010F, but **telescope** 15 in., **object glass** $1\frac{1}{2}$ in. (effective aperture 1.44 in.), MAGNIFYING POWER 26 diameters. With No. 5178 Split Tripod. each

Weight of instrument about $11\frac{1}{2}$ lbs. **Weight** of tripod about 10 to 11 lbs.

This instrument can be furnished with a 16-inch inverting telescope, magnifying power 28 X, upon order. Price quoted upon request.

Extension Tripod No. 5180 (see page 438) furnished in place of 5178 at additional charge, each

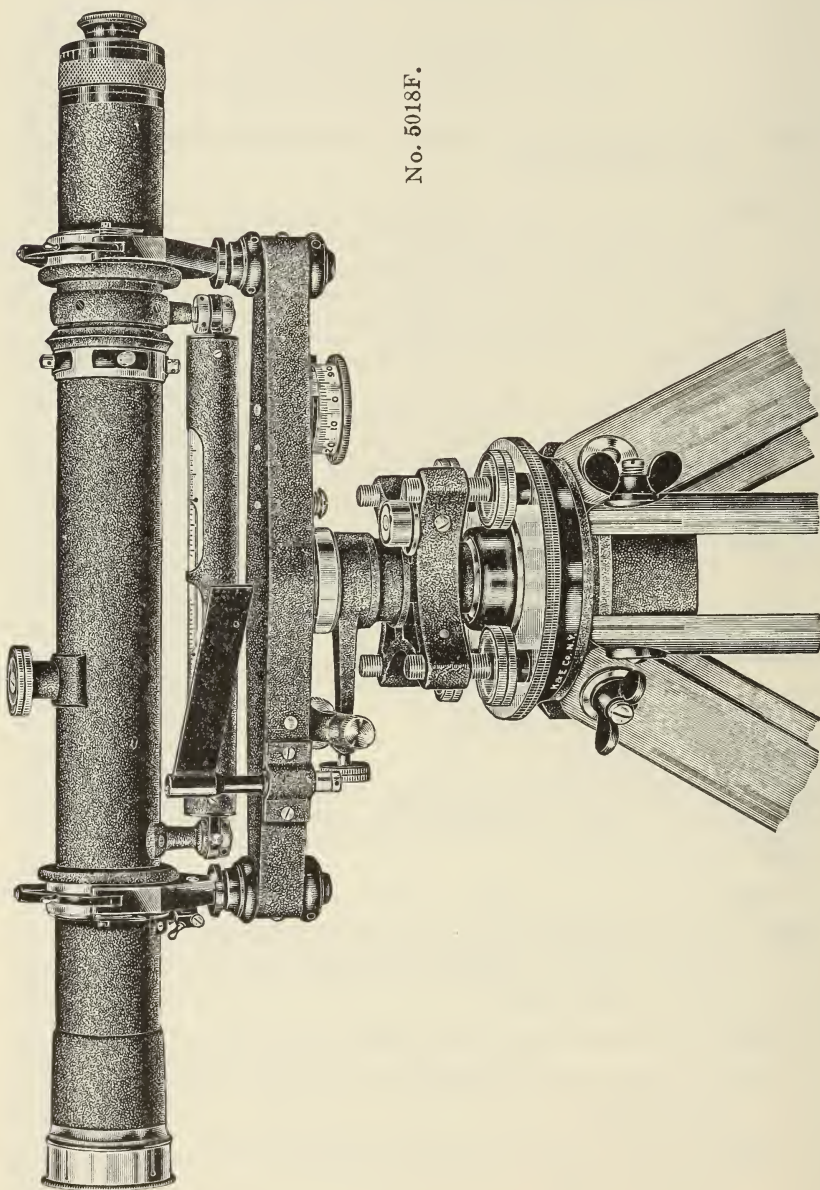
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K & E

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PRECISION Y LEVEL

No. 5018F.



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K & E

REG. U. S. PAT. OFF.

PRECISION Y LEVEL WITH MICROMETER CONTROL.

(For synopsis of levels, see page 360).

(See also illustration on page 370).

(For Internal Focusing Telescope, see page 365).

5018F. K & E PRECISION Y LEVEL, with INTERNAL FOCUSING TELESCOPE.

Telescope 18 in., achromatic terrestrial. OBJECT GLASS $1\frac{5}{8}$ in. (effective aperture 1.60 in.). INTERNAL DRAWTUBE, focused by improved spiral toothed rack and pinion movement. EYEPIECE, erecting, adjustable, with improved micrometer focusing arrangement with resetting scale. MAGNIFYING POWER 32 diameters. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 20 seconds of arc per graduation (2 mm). Level tube adjustable vertically and horizontally. HINGED SIDE MIRROR, for observing level vial.

Level Bar of gun metal, improved construction, of great strength and rigidity. Within this bar is another bar rigidly attached to the center. The outer bar carrying the Y's is pivoted on the inner bar, its movement in altitude being controlled by a GRADUATED MICROMETER SCREW and a strong counter-spring. One Y can be raised or lowered and is provided with an ADJUSTABLE HINGED STOP for placing the telescope with the cross hairs in a vertical and horizontal position. The Y's are locked by an improved arrangement dispensing with pinbolts. A circular SPIRIT LEVEL for approximate leveling is placed on the leveling head.

Center of bronze, precisely fitted. Improved CLAMP and TANGENT SCREW with counterspring. Tangent, Clamp and Leveling Screws of nickel silver. Four leveling screws.

Morocco Finish.

Instrument complete, with sunshade, adjusting pins, center key and waterproof cover, in fine polished mahogany Case and with No. 5178 Split Tripod.....each

Weight of instrument about 13 lbs.

Weight of tripod about 10 to 11 lbs.

Extension Tripod No. 5180 (see page 438) furnished in place of Tripod No. 5178 at an additional charge,each

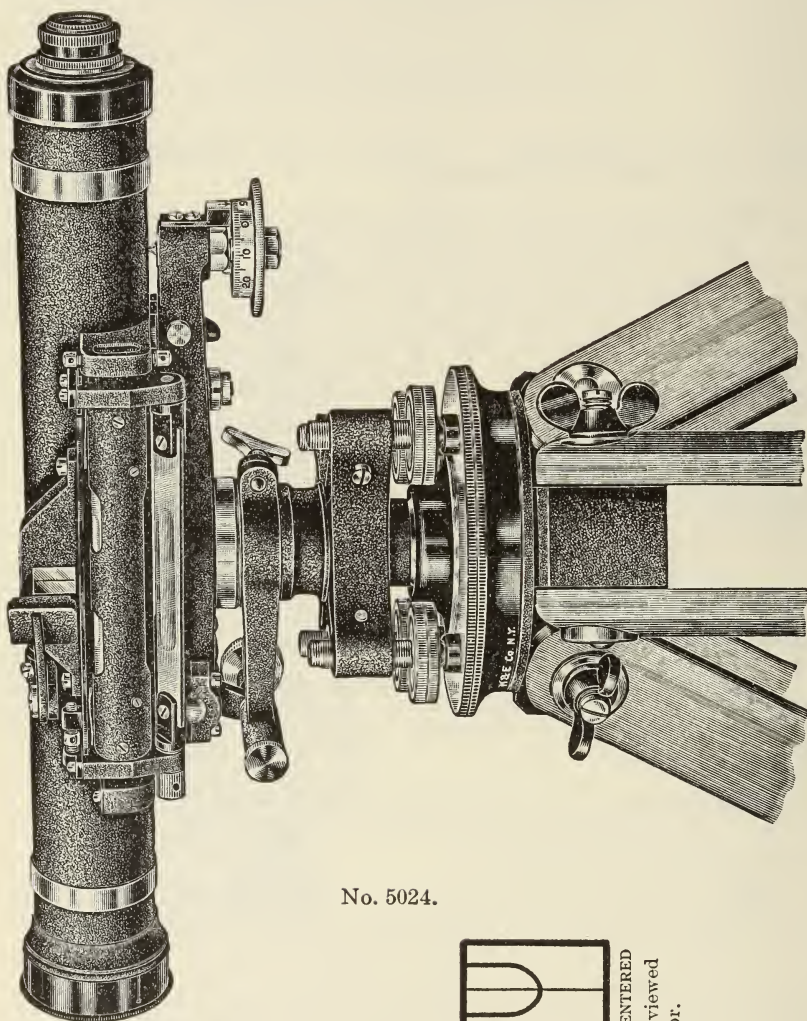
The K & E Precision Y Level, is so constructed that the level of the telescope is constantly under immediate control of the observer. The head of the micrometer screw is graduated and reads opposite an index which registers the number of revolutions of the screw. Two full revolutions will move the crosshair to the extent of 1 foot on a rod at a distance of about 100 feet. By means of this micrometer screw, delicate re-adjustment of the level can be made for each sighting and the difference in level can be read off the same as with a gradienter. A side mirror, mounted on the bar, enables the observer to watch the bubble from his position at the eyepiece. Where the station is frequently changed or where the ground is not firm, the Precision Level will save much time and will give closer results than a plain Y level, because the level of the telescope can be corrected for each sight by means of the micrometer screw.

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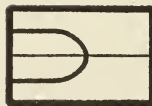
K & E

REG. U. S. PAT. OFF.

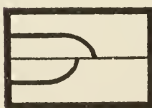
PRECISE LEVEL.



No. 5024.



CENTERED
Ends of bubble as viewed
in the reflector.



NOT CENTERED



K & E

REG. U. S. PAT. OFF.

PRECISE LEVEL

FOUR LEVELING SCREWS.

5024. K & E PRECISE LEVEL, with INTERNAL FOCUSING TELESCOPE.

Telescope 14 in., achromatic astronomical (inverting). Telescope tube bored from one piece of rolled stainless steel. **INTERNAL DRAWTUBE**, focused by improved spiral toothed rack and pinion movement. **OBJECT GLASS** $1\frac{5}{8}$ in. diameter (effective aperture 1.60 in.) **EYEPIECE** with improved spiral focusing arrangement. **MAGNIFYING POWER** 40 diameters. The telescope is tiltably attached to the level bar, and has a tilting leverage of 6 inches. **MICROMETER SCREW**, by means of which the line of collimation is put into the level position. **LEVER HANDLE** for raising the telescope off the micrometer screw to avoid jarring the telescope while the instrument is carried about. **STADIA HAIRS** fixed, ratio 0.6:100*, reading direct from center of instrument, the constant ($f + c$) being negligible.

Level to Telescope. The glass **SPIRIT LEVEL** is mounted in a tube of rolled stainless steel. It is ground to a sensitiveness of about 10 seconds of arc per 2 mm. of length. Through an ingenious **REFLECTOR AND PRISM SYSTEM**, the position of the bubble may be observed while the rod is being read, without moving away from the eyepiece. The bubble is centered by bringing its two ends, as seen through the prism system, into coincidence (see cut page 372). The glass vial is chambered to admit of regulating the length of the bubble. A **CIRCULAR SPIRIT LEVEL** for approximate leveling is placed at the right-hand side and may be observed by means of a stainless steel reflector attached to it.

Center of bell metal, very precisely fitted into socket of bronze leveling head. Improved **CLAMP** and **TANGENT SCREW** with counterspring. Tangent, clamp and leveling screws of nickel silver. **FOUR LEVELING SCREWS.**

Morocco Finish.

Instrument complete. with sunshade, adjusting pins and waterproof cover in fine polished mahogany Case and with Tripod No. 5178. each

Weight of instrument about 8 lbs. Weight of tripod about 10 to 11 lbs.

Extension Tripod No. 5180 (see page 438) in place of Tripod No. 5178, furnished at an additional charge each

One of the advantages of this level is the possibility of speed in leveling without loss of precision. The coincidence method of centering the bubble is very sensitive; tests having shown that a bubble having a curvature of 10 seconds per 2 mm. can be quickly and repeatedly set to bring the line of collimation level to within less than $\frac{1}{2}$ second of arc.

*Stadia Hairs, ratio 1:100 will be furnished, when ordered with the instrument, without extra charge.

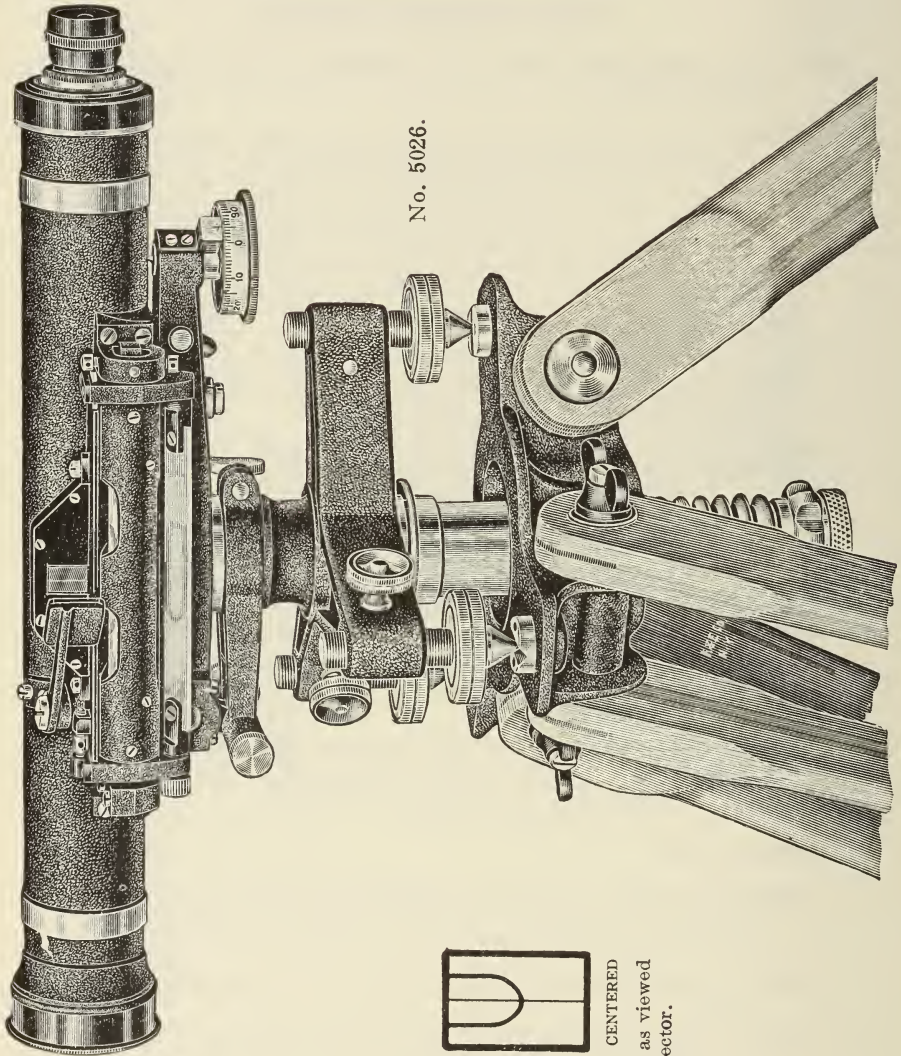
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K & E

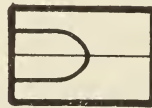
REG. U. S. PAT. OFF.

PRECISE LEVEL.

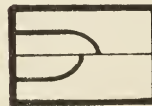
As made for U. S. Geological Survey.



No. 5026.



CENTERED
Ends of bubble as viewed
in the reflector.



NOT CENTERED
Ends of bubble as viewed
in the reflector.



K & E

REG. U. S. PAT. OFF.

PRECISE LEVEL

AS MADE FOR U. S. GEOLOGICAL SURVEY.

5026. K & E PRECISE LEVEL, with INTERNAL FOCUSING TELESCOPE.

Telescope 14 in., achromatic astronomical (inverting). Telescope tube bored from one piece of rolled stainless steel. INTERNAL DRAWTUBE, focused by improved spiral toothed rack and pinion movement. OBJECT GLASS $1\frac{1}{2}$ in. diameter (effective aperture 1.60 in.). EYEPIECE with improved spiral focusing arrangement. MAGNIFYING POWER 40 diameters. The telescope is tiltably attached to the level bar, and has a tilting leverage of 6 inches. MICROMETER SCREW, by means of which the line of collimation is put into the level position. LEVER HANDLE for raising the telescope off the micrometer screw to avoid jarring the telescope while the instrument is carried about. STADIA HAIRS fixed, ratio 0.6 : 100,* reading direct from center of instrument, the constant ($f + c$) being negligible.

Level to Telescope. The glass SPIRIT LEVEL is mounted in a tube of rolled stainless steel. It is ground to a sensitiveness of about 10 seconds of arc per 2 mm. of length. Through an ingenious REFLECTOR AND PRISM SYSTEM, the position of the bubble may be observed while the rod is being read, without moving away from the eyepiece. The bubble is centered by bringing its two ends, as seen through the prism system, into coincidence (see cut page 374). The glass vial is chambered to admit of regulating the length of the bubble. A CIRCULAR SPIRIT LEVEL for approximate leveling is placed at the right-hand side and may be observed by means of a stainless steel reflector attached to it.

Center of bell metal, very precisely fitted into socket of bronze leveling head. Improved CLAMP and TANGENT SCREW with counterspring. Tangent, clamp and leveling screws of nickel silver. THREE LEVELING SCREWS.

Morocco Finish.

Instrument complete, with sunshade, adjusting pins and waterproof cover in fine polished mahogany Case and with strong tripod of firm texture straight-grained ash with legs of the one-piece split type. each

Weight of instrument about 9 lbs. **Weight of tripod** about 16 lbs.

One of the advantages of this level is the possibility of speed in leveling without loss of precision. The coincidence method of centering the bubble is very sensitive; tests having shown that a bubble having a curvature of 10 seconds per 2 mm. can be quickly and repeatedly set to bring the line of collimation level to within less than $\frac{1}{2}$ second of arc.

*Stadia Hairs, ratio 1:100 will be furnished, when ordered with instrument, without extra charge.

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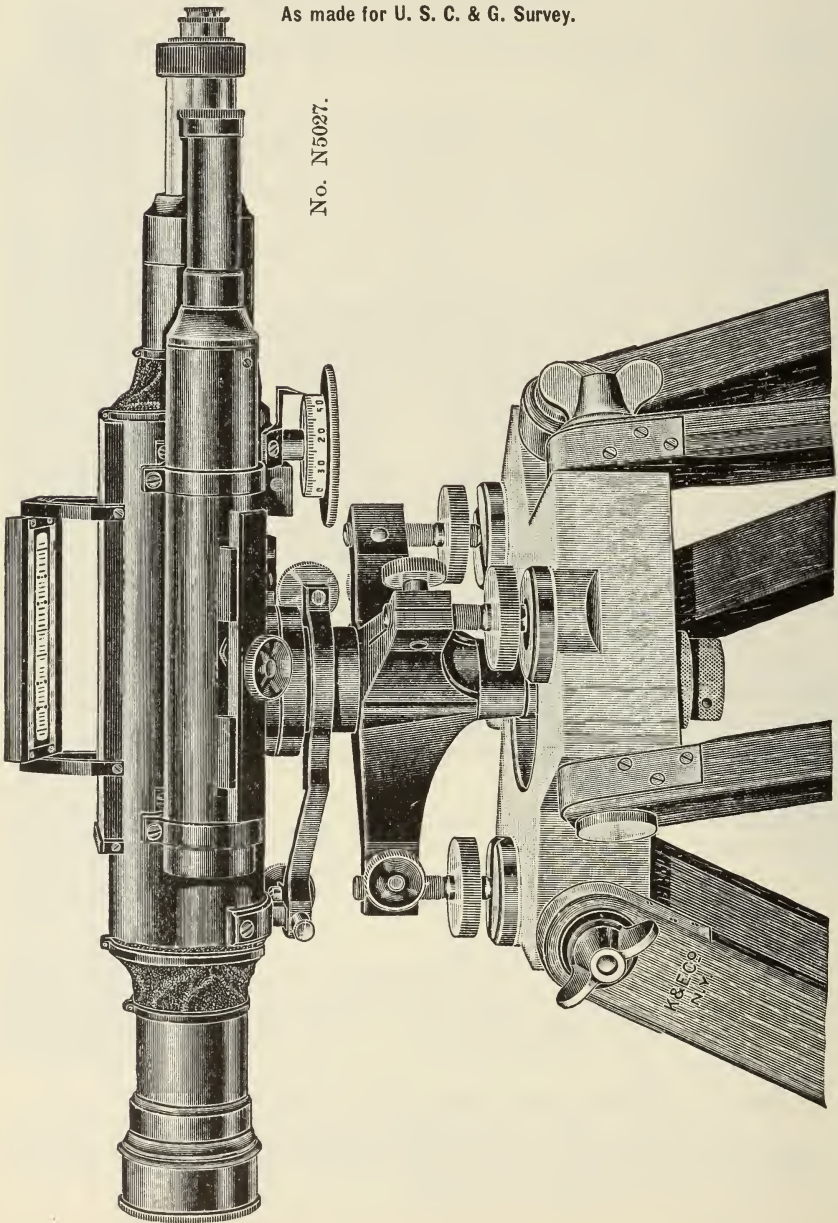
K & E

REG. U. S. PAT. OFF.

PRECISE LEVEL.

As made for U. S. C. & G. Survey.

No. N5027.





K & E
REG. U. S. PAT. OFF.

PRECISE LEVEL.

AS MADE FOR U. S. C. & G. SURVEY.

N5027. K & E PRECISE LEVEL, with INTERNAL FOCUSING TELESCOPE.

Telescope 17 in., achromatic astronomical (inverting), INTERNAL FOCUSING, with improved spiral toothed rack and pinion movement. The telescope body, with the objective mount, is bored from a solid piece of stainless steel. The eye piece draw, vial housing, and other essential parts are made of stainless steel. OBJECT GLASS $1\frac{3}{4}$ in. diameter (effective aperture 1.65 in.). EYEPIECE with improved spiral focusing arrangement. Two eyepieces; MAGNIFYING POWER 32 and 43 diameters. STADIA HAIRS fixed, ratio 0.3:100. The telescope is mounted within a bronze housing, at the center of which two pivot screws provide a horizontal axis about which the telescope can be moved in altitude, and the line of collimation put into the horizon by means of a MICROMETER SCREW at the other end of the tubular support. The head of this micrometer screw is divided into 100 parts on a graduated ring. A LEVER HANDLE raises the telescope off the micrometer screw to prevent jarring the telescope while the instrument is carried about.

Level to Telescope. The high-grade CHAMBERED level vial is placed in a recess of the telescope barrel. It is graduated on the glass and ground to a sensitiveness of about 2 seconds of arc per graduation (2 mm). The level is observed by means of a device mounted in a tube placed alongside the telescope. It consists of a set of PRISMS so arranged as to reflect the image of the bubble to the eye of the observer. The prisms are adjustable for the length of the bubble.

A circular spirit level for approximate leveling is placed at the right-hand side of the telescope support and may be observed by means of a reflector attached to it.

Center of stainless steel, extra long, very precisely fitted into socket of cast iron leveling head. Improved CLAMP and TANGENT SCREW with counterspring. Tangent Screws of nickel silver. THREE LEVELING SCREWS of stainless steel.

Instrument complete, with sunshade, adjusting pins and waterproof cover, in fine polished mahogany Case and with strong Split Tripod, which has a head of strong, light, corrosion resistant special metal, and legs about 56 in. long.....each

Weight of instrument about $14\frac{1}{2}$ lbs. Weight of tripod about 16 lbs.

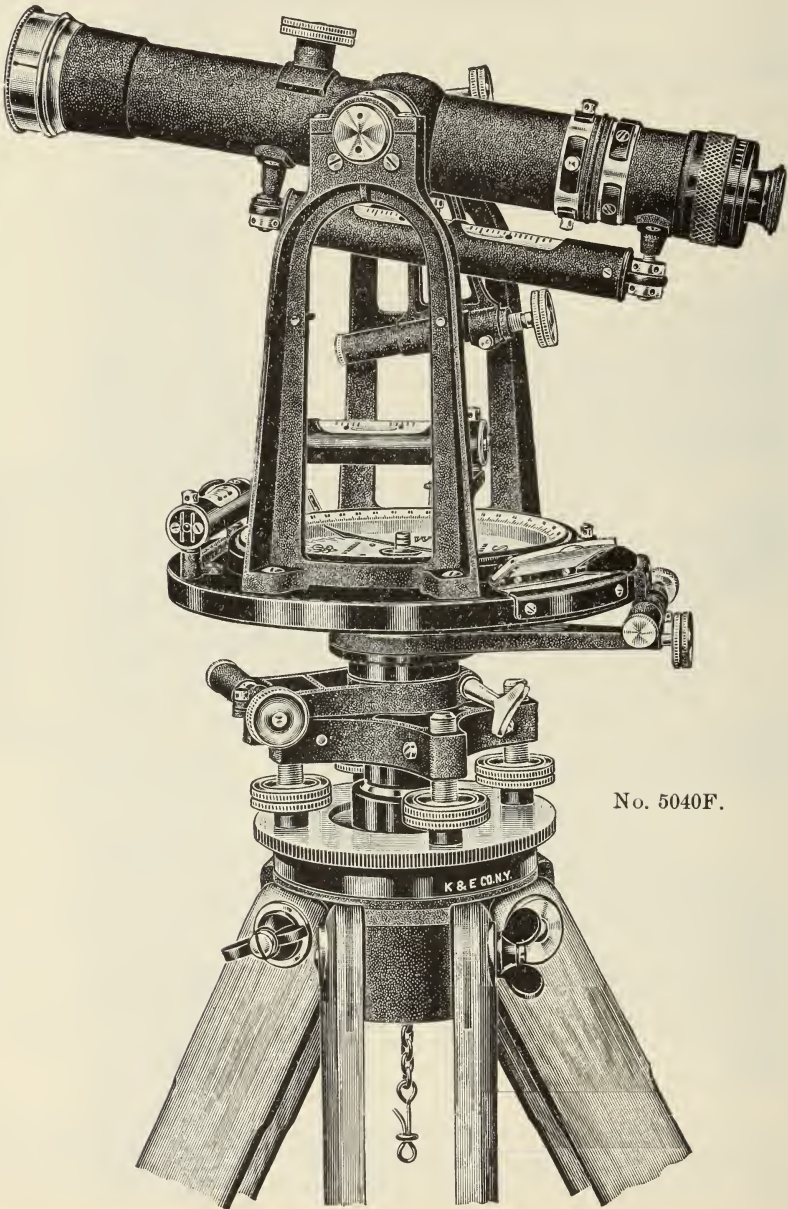
The K & E Precise Level has an unusually long vertical axis, low center of gravity and small area exposed to wind pressure. These three features give it unusual stability under adverse field conditions. Stationed at the eyepiece end, the observer can easily see the bubble with his left eye at the same instant that he reads the rod through the telescope.

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K & E

REG. U. S. PAT. OFF.

ENGINEER'S TRANSIT.



No. 5040F.



K & E

REG. U. S. PAT. OFF.

ENGINEER'S TRANSITS.

6 $\frac{1}{2}$ INCH HORIZONTAL LIMB.

(For Synopsis of Transits, see page 361.)

(For Internal Focusing Telescope see page 365.)

5040F. K & E ENGINEER'S TRANSIT with INTERNAL FOCUSING TELESCOPE.

Telescope 11 $\frac{1}{2}$ in., achromatic terrestrial. OBJECT GLASS 1 $\frac{7}{8}$ in. (effective aperture 1.36 in.). INTERNAL DRAWTUBE with spiral toothed rack and pinion movement. EYEPIECE with improved micrometer focusing arrangement with resetting scale. MAGNIFYING POWER 24 diameters. STADIA HAIRS fixed, ratio 1:100 reading direct from center of instrument, the constant (f+c) being negligible. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation (2mm.) Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 6 $\frac{1}{2}$ in. diameter, graduated on *solid silver* to half degrees and numbered like Fig. IV, page 362. Opposite double-direct VERNIERS at about 30° with telescope, reading to one minute. HINGED IVORY REFLECTORS. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 70 seconds of arc per graduation (2mm).

Compass. GOLD-PLATED NEEDLE about 4 $\frac{1}{2}$ in. COMPASS RING, beveled, graduated to half degrees. COMPASS BOX cover has glass bezeled into threaded ring, watertight, removable. VARIATION PLATE.

Centers, hard bronze anti-friction alloys, extra long and precisely fitted. FOUR LEVELING SCREWS. SHIFTING CENTER. Improved CLAMP and TANGENT SCREW with counterspring. Tangent, Clamp and Leveling Screws of nickel silver.

Morocco Finish.

Instrument complete, with strong, light, metal base-plate, trivet points, sunshade, plumb bob, magnifying glass, adjusting pins, screw-driver, oil can, brush and water-proof cover, packed in fine polished mahogany Case, and with No. 5178 Split Tripod. . each

Weight of instrument about 15 lbs. Weight of tripod about 10 to 11 lbs.

***5040FR. K & E ENGINEER'S TRANSIT, INTERNAL FOCUSING**, like No. 5040F, but with **astronomical** (inverting) eyepiece. MAGNIFYING POWER 28 diameters. Telescope 12 in. long with effective aperture of 1.44 in. each

Weight of instrument about 15 lbs. Weight of tripod about 10 to 11 lbs.

Extension Tripod No. 5180 (see page 438) furnished in place of 5178 at additional charge, each

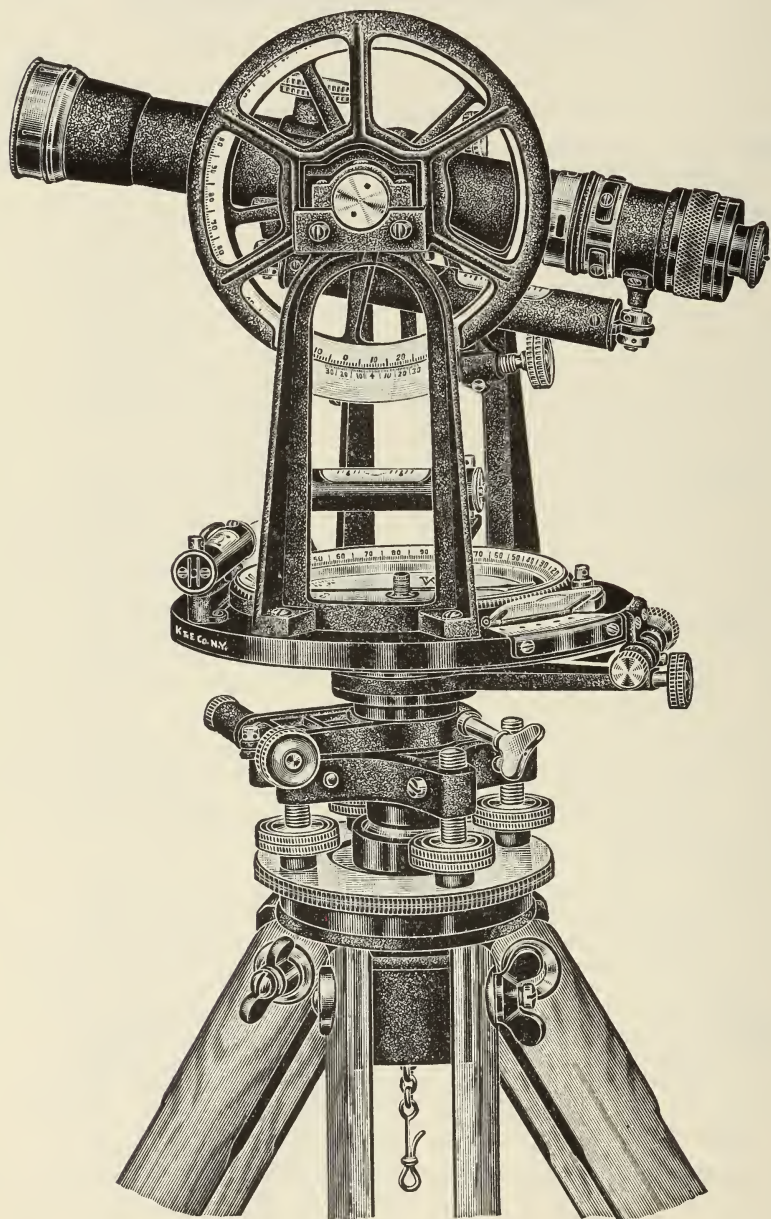
*Made to order only.

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ENGINEER'S TRANSIT.



No. 5060 F.

KEUFFEL & ESSER CO., NEW YORK

K & E

REG. U. S. PAT. OFF.

ENGINEER'S TRANSIT.

6¼ INCH HORIZONTAL LIMB.

(For Synopsis of Transits, see page 361).

(See also illustration on page 380)

(For Internal Focusing Telescope, see page 365).

5060F. K & E ENGINEER'S TRANSIT with INTERNAL FOCUSING TELESCOPE and VERTICAL CIRCLE.

Telescope 11½ in., achromatic terrestrial. OBJECT GLASS 1⅞ in. (effective aperture 1.36 in.). INTERNAL DRAWTUBE with improved spiral toothed rack and pinion movement. EYEPIECE with improved micrometer focusing arrangement with resetting scale. MAGNIFYING POWER 24 diameters. STADIA HAIRS fixed, ratio 1:100 reading direct from center of instrument, the constant ($f + c$) being negligible. Fine SPIRIT LEVEL to Telescope, graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation (2mm). Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 6¼ in. diameter, graduated on *solid silver* to half degrees and numbered like Fig. IV, page 362. Opposite double-direct VERNIERS at about 30° with telescope, reading to one minute. HINGED IVORY REFLECTORS. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 70 seconds of arc per graduation (2mm).

Compass. GOLD PLATED NEEDLE about 4½ in. COMPASS RING, beveled, graduated to half degrees. COMPASS BOX cover has glass beveled into threaded ring, watertight, removable, VARIATION PLATE.

Vertical Circle 5 in. diameter, graduated on *solid silver* to half degrees. Double-direct VERNIER reading to one minute. Removable GUARD to Circle.

Centers, hard bronze anti-friction alloys, extra long and precisely fitted. FOUR LEVELING SCREWS. SHIFTING CENTER. Improved CLAMP and TANGENT SCREW with counterspring. Tangent, Clamp and Leveling Screws of nickel silver.

Morocco Finish.

Instrument complete, with strong, light, metal base-plate, trivet points, sunshade, plumb bob, magnifying glass, adjusting pins, screw-driver, oil can, brush and water-proof cover, packed in fine polished mahogany Case, and with No. 5178 Split Tripod. . each

Weight of instrument about 15½ lbs. Weight of tripod about 10 to 11 lbs.

***5060FR. K & E ENGINEER'S TRANSIT, INTERNAL FOCUSING, with VERTICAL CIRCLE** like No. 5060F, but with astronomical (inverting) telescope. MAGNIFYING POWER 28 diameters. Telescope 12in. long, with effective aperture of 1.44 in. each

Weight of instrument about 15½ lbs. Weight of tripod about 10 to 11 lbs.

***5050F. K & E ENGINEER'S TRANSIT, INTERNAL FOCUSING**, like No. 5060F, but with **Vertical Arc**, of 5 in. diameter, graduated on solid silver to half degrees, double direct Vernier reading to one minute. each

Weight of instrument about 15½ lbs.

Extension Tripod No. 5180 (see page 438) furnished in place of 5178 at additional charge, each

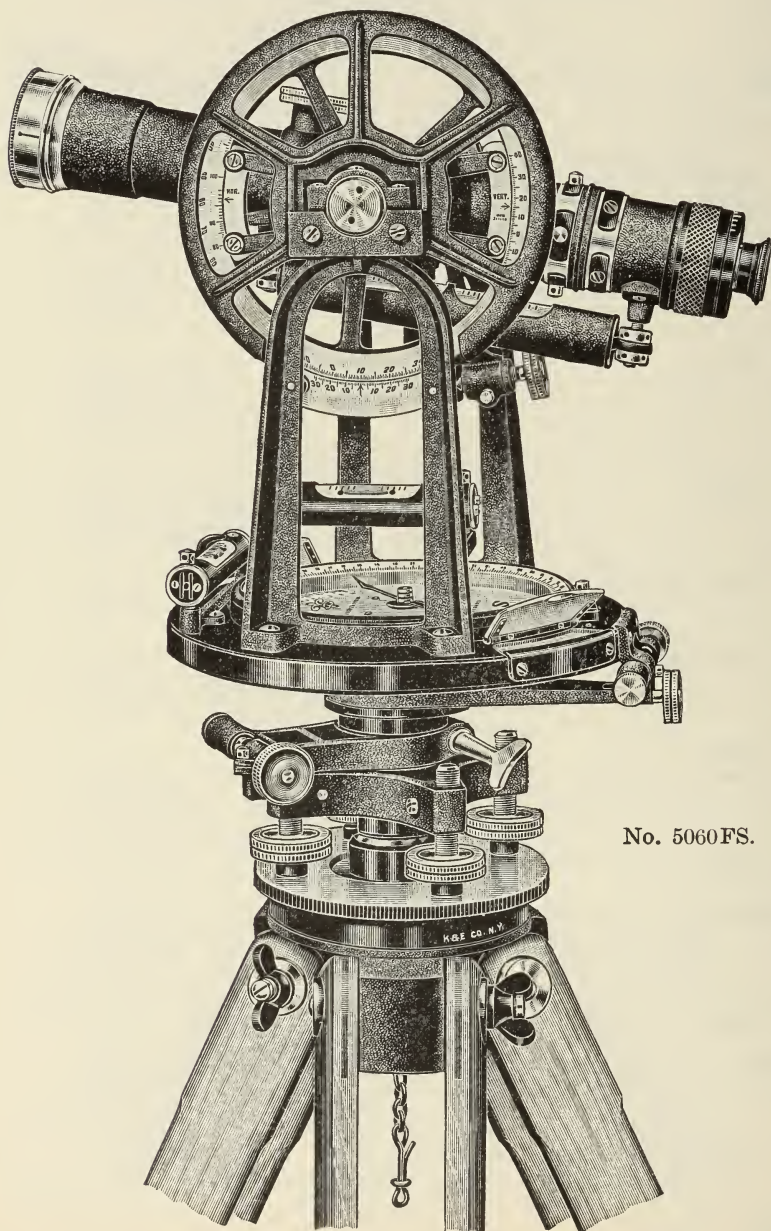
*Made to order only.

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ENGINEER'S TRANSIT.



No. 5060FS.

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ENGINEER'S TRANSIT.

6 $\frac{1}{4}$ INCH HORIZONTAL LIMB.

(For Synopsis of Transits, see page 361).

(See also illustration on page 382.)

(For Internal Focusing Telescope, see page 365).

5060FS. K & E ENGINEER'S TRANSIT with INTERNAL FOCUSING TELESCOPE and STADIA CIRCLE.

Telescope 11 $\frac{1}{2}$ in., achromatic terrestrial. OBJECT GLASS 1 $\frac{7}{8}$ in. (effective aperture 1.36 in.). INTERNAL DRAWTUBE with improved spiral toothed rack and pinion movement. EYEPIECE with improved micrometer focusing arrangement with resetting scale. MAGNIFYING POWER 24 diameters. STADIA HAIRS fixed, ratio 1:100 reading direct from the center of the instrument, the constant ($f+c$) being negligible. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation (2mm). Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 6 $\frac{1}{4}$ in. diameter, graduated on *solid silver* to half degrees and numbered like Fig. IV, page 362. Opposite double-direct VERNIERS at about 30° with telescope, reading to one minute. HINGED IVORY REFLECTORS. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 70 seconds of arc per graduation (2mm).

Compass. GOLD PLATED NEEDLE about 4 $\frac{1}{2}$ in. COMPASS RING beveled, graduated to half degrees. COMPASS BOX cover has glass bezeled into threaded ring, watertight, removable. VARIATION PLATE.

Stadia Circle 5 in. diameter, fully graduated on *solid silver* to half degrees and in percentage factors for obtaining the horizontal and vertical components of observed stadia distances. Double-direct VERNIER reading to one minute. Removable GUARD to Circle.

Centers, hard bronze anti-friction alloys, extra long and precisely fitted. FOUR LEVELING SCREWS. SHIFTING CENTER. Improved CLAMP and TANGENT SCREW with counterspring. Tangent, Clamp and Leveling Screws of nickel silver.

Morocco Finish.

Instrument complete, with strong, light, metal base-plate, trivet points, sunshade, plumb bob, magnifying glass, adjusting pins, screw-driver, oil can, brush and water-proof cover, packed in fine polished mahogany Case, and with No. 5178 Split Tripod. . . each

Weight of instrument about 16 lbs. Weight of tripod about 10 to 11 lbs.

***5060FRS. K & E ENGINEER'S TRANSIT, INTERNAL FOCUSING, with STADIA CIRCLE**, like No. 5060FS. but with **astronomical** (inverting) telescope. MAGNIFYING POWER, 28 diameters. Telescope 12 in. long, with effective aperture of 1.44 in. each

Weight of instrument about 15 $\frac{1}{2}$ lbs. Weight of tripod about 10 to 11 lbs.

Extension Tripod No. 5180 (see page 438) furnished in place of 5178 at additional charge, each

***Made to order only.**

For K & E Stadia Circle see page 414.

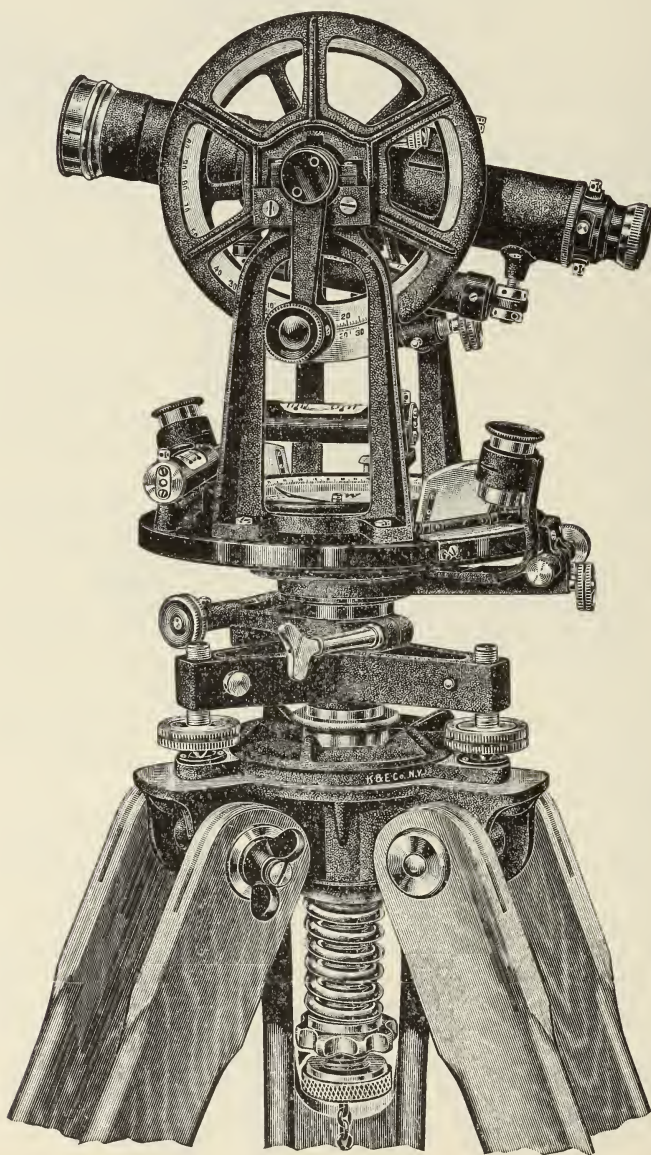
For graduations reading to 20 or 30 seconds, see page 414.

KEUFFEL & ESSER CO., NEW YORK

K & E

REG. U. S. PAT. OFF.

**ENGINEER'S MOUNTAIN AND
MINING TRANSIT.
THREE LEVELING SCREWS.**



No. 5070F.

KEUFFEL & ESSER CO. NEW YORK

K & E

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ENGINEER'S MOUNTAIN AND MINING TRANSIT. 5½ INCH HORIZONTAL LIMB.

(For Synopsis of Transits, see page 361).

(For Internal Focusing Telescope, see page 365).

5070F. K & E ENGINEER'S MOUNTAIN AND MINING TRANSIT with INTERNAL FOCUSING TELESCOPE and VERTICAL CIRCLE.

Telescope 9½ in., achromatic astronomical (inverting). OBJECT GLASS 1⅞ in. (effective aperture 1.36 in.). INTERNAL DRAW-TUBE with improved spiral toothed rack and pinion movement. EYEPIECE with spiral focusing arrangement with re-setting scale, and adaptor for attaching prism. MAGNIFYING POWER 23 diameters. STADIA HAIRS fixed, ratio 1:100 reading direct from the center of the instrument, the constant (1+c) being negligible. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation (2mm). Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 5½ in. diameter, graduated on *solid silver*, to 15 minutes and numbered like Fig. IV, page 362. Two opposite double-direct VERNIERS, reading to 20 seconds, placed at an angle of about 30° to the line of sight. MAGNIFIERS to both Verniers. HINGED IVORY REFLECTORS. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 75 seconds of arc per graduation (2mm).

Compass. GOLD PLATED NEEDLE about 3¾ in. COMPASS RING beveled, graduated to half degrees. COMPASS BOX cover has glass beveled into threaded ring, watertight, removable. VARIATION PLATE.

Vertical Circle 4½ in. diameter, graduated on *solid silver* to 15 minutes, double-direct vernier reading to 20 seconds. MAGNI-FIER to vernier. Removable GUARD to Circle.

Centers, hard bronze anti-friction alloys, extra long and precisely fitted. THREE LEVELING SCREWS. SHIFTING CENTER. Improved CLAMP and TANGENT SCREW with counterspring. Tangent, Clamp and Leveling Screws of nickel silver.

Morocco Finish.

Instrument complete with base-board, sunshade, plumb bob, magnifying glass, adjusting pins, screw-driver, oil can, brush and waterproof cover, packed in fine polished mahogany Case, and with Split Tripod. each

Weight of instrument about 12 lbs. **Weight of tripod** about 14 lbs.

5070FS. K & E ENGINEER'S MOUNTAIN AND MINING TRANSIT, INTERNAL FOCUSING, like No. 5070F, but with K & E Stadia Circle 4½ in. dia., in place of vertical circle, each

5071F. K & E ENGINEER'S MOUNTAIN AND MINING TRANSIT, INTERNAL FOCUSING, like No. 5070F, but horizontal and vertical limb graduated to read to 30 seconds; without magnifiers. each

5071FS. K & E ENGINEER'S MOUNTAIN AND MINING TRANSIT, INTERNAL FOCUSING, like No. 5071F, but with K & E Stadia Circle 4½ in. dia., in place of vertical circle. each

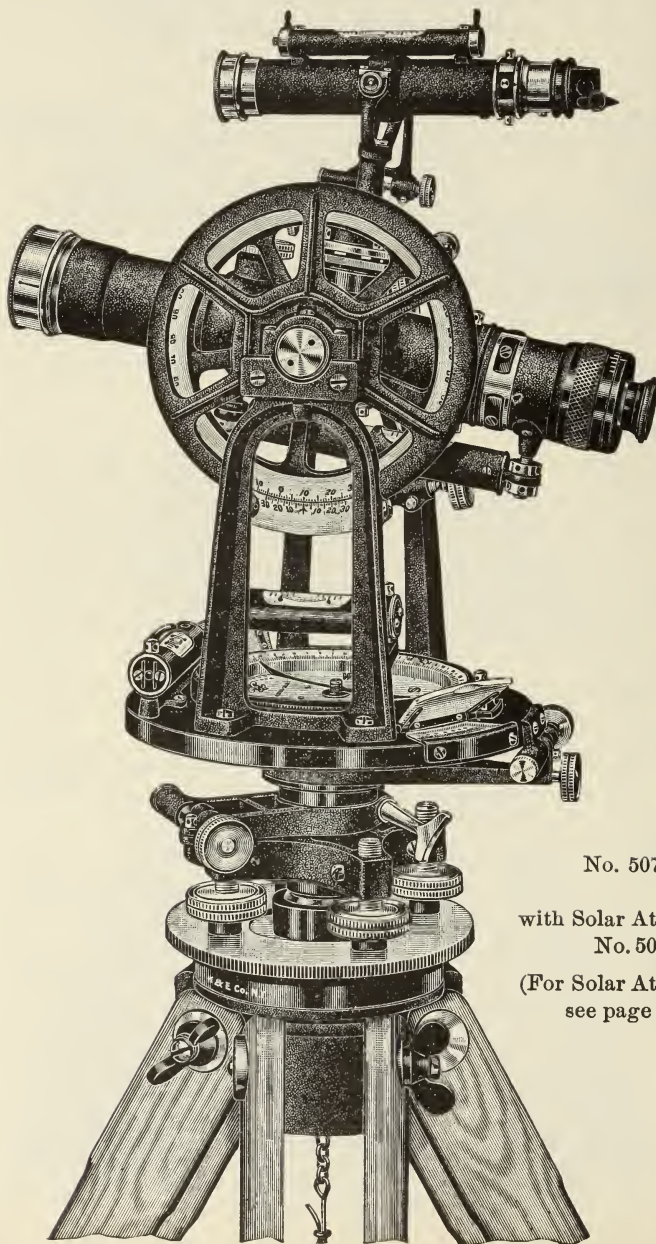
Special Extension Tripod furnished in place of Split Tripod at additional charge each

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K & E

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ENGINEER'S MOUNTAIN AND MINING TRANSIT.



No. 5076F

with Solar Attachment
No. 5090

(For Solar Attachment
see page 410).

KEUFFEL & ESSER CO. NEW YORK

K & E

REG. U. S. PAT. OFF.

ENGINEER'S MOUNTAIN AND MINING TRANSIT.

5½ INCH HORIZONTAL LIMB.

(For Synopsis of Transits, see page 361).

(See also illustration on page 386).

(For Internal Focusing Telescope, see page 362).

5076F. K & E ENGINEER'S MOUNTAIN AND MINING TRANSIT with INTERNAL FOCUSING TELESCOPE and VERTICAL CIRCLE.

Telescope 10 in., achromatic terrestrial. OBJECT GLASS 1½ in. (effective aperture 1.29 in.). INTERNAL DRAWTUBE with improved spiral toothed rack and pinion movement. EYEPIECE with improved micrometer focusing arrangement with resetting scale. MAGNIFYING POWER 20 diameters. STADIA HAIRS fixed, ratio 1:100 reading direct from the center of the instrument, the constant ($f+c$) being negligible. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation (2mm). Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 5½ in. diameter, graduated on *solid silver* to half degrees and numbered like Fig. IV, page 362. Two opposite double-direct VERNIERS at about 30° with telescope, reading to one minute. HINGED IVORY REFLECTORS. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 75 seconds of arc per graduation (2mm).

Compass. GOLD PLATED NEEDLE about 3¾ in. COMPASS RING beveled, graduated to half degrees. COMPASS BOX cover has glass beveled into threaded ring, watertight, removable. VARIATION PLATE.

Vertical Circle 4½ in. diameter, graduated on *solid silver* to half degrees, double-direct vernier reading to one minute. Removable GUARD to Circle.

Centers, hard bronze anti-friction alloys, extra long and precisely fitted. FOUR LEVELING SCREWS. SHIFTING CENTER. Improved CLAMP and TANGENT SCREW with counterspring. Tangent, Clamp and Leveling Screws of nickel silver.

Morocco Finish.

Instrument complete with strong, light, metal base-plate, trivet points, sunshade, plumb bob, magnifying glass, adjusting pins, screw-driver, oil can, brush and water-proof cover, packed in fine polished mahogany Case, and with No. 5178 Split Tripod . . . each

Weight of instrument about 13 lbs. **Weight** of tripod about 10 to 11 lbs.

5076FS. K & E ENGINEER'S MOUNTAIN AND MINING TRANSIT, INTERNAL FOCUSING like No. 5076F, but with Stadia Circle 4½ in. diameter. each

*5074F. K & E ENGINEER'S MOUNTAIN AND MINING TRANSIT, INTERNAL FOCUSING, as described under No. 5076F, but with Vertical Arc of 4½ in. diameter, graduated on *solid silver* to half degrees, double-direct VERNIER reading to one minute. each

Weight of instrument about 13 lbs. **Weight** of tripod about 10 to 11 lbs.

Extension Tripod No. 5180 (see page 438) furnished in place of 5178 at additional charge, each

*Made to order only.

For K & E Stadia Circle, see page 414.

For Solar Attachment, see page 410.

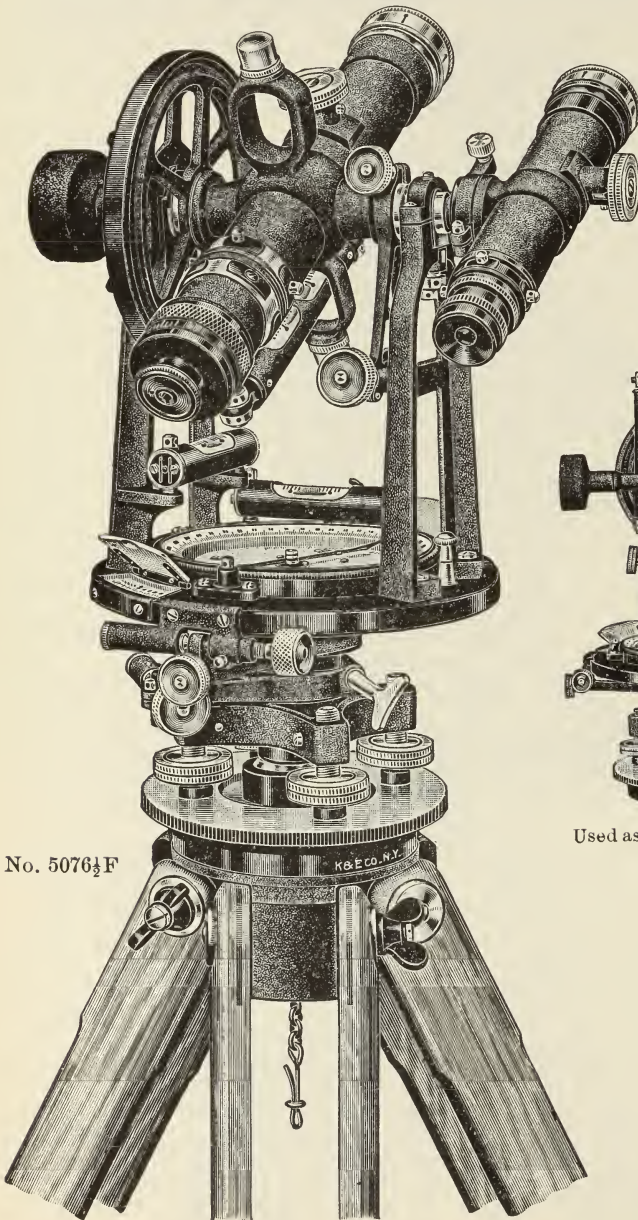
For graduations reading to 20 or 30 seconds, see page 414.

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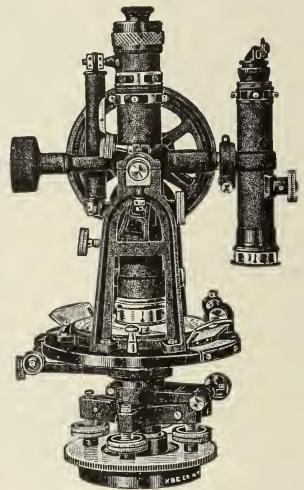
K & E

REG. U. S. PAT. OFF.

**ENGINEER'S MINING TRANSIT
WITH INTERCHANGEABLE TOP AND SIDE TELESCOPE.**



No. 5076 $\frac{1}{2}$ F



Used as Top Telescope.

Used as Side Telescope.

KEUFFEL & ESSER CO., NEW YORK

K & E

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ENGINEER'S MINING TRANSIT.

5½ INCH HORIZONTAL LIMB.

INTERCHANGEABLE TOP AND SIDE TELESCOPE.

(For Synopsis of Transits, see page 361).

(See also illustration on page 388).

(For Internal Focusing Telescope, see page 365).

5076½F. K & E ENGINEER'S MINING TRANSIT, INTERNAL FOCUSING, with INTERCHANGEABLE TOP AND SIDE TELESCOPE.

Telescope 10 in., achromatic terrestrial. OBJECT GLASS 1½ in. (effective aperture 1.29 in.). INTERNAL DRAWTUBE with improved spiral toothed rack and pinion movement. EYEPIECE with improved micrometer focusing arrangement with resetting scale. MAGNIFYING POWER 20 diameters. STADIA HAIRS fixed, ratio 1:100 reading direct from the center of the instrument, the constant (f+c) being negligible. FINE SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation (2mm). Improved CLAMP and TANGENT SCREW with counterspring.

Auxiliary Telescope 6½ in., achromatic astronomical (inverting), Internal Focusing. OBJECT GLASS 1½ in., (effective aperture 1.06 in.). INTERNAL DRAWTUBE with improved spiral toothed rack and pinion movement. EYEPIECE with spiral focusing arrangement. MAGNIFYING POWER 14 diameters. This auxiliary telescope for Vertical Sighting is attachable on one end or on top of the main telescope. Detachable counter weight. The upper post on the telescope axis has center point for plumbing from overhead.

Horizontal Limb 5½ in., diameter, graduated on *solid silver* to half degrees and numbered like Fig. IV, page 362. Two opposite double-direct VERNIERS at about 30° with telescope reading to one minute. HINGED IVORY REFLECTORS. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 75 seconds of arc per graduation (2mm).

Compass. GOLD PLATED NEEDLE about 4 in. COMPASS RING beveled, graduated to half degrees. COMPASS BOX cover has glass beveled into threaded ring, watertight, removable. VARIATION PLATE.

Vertical Circle 4½ in. diameter, graduated on *solid silver* to half degrees, double-direct vernier reading to 1 minute. Removable GUARD to Circle.

Centers, hard bronze anti-friction alloys, extra long and precisely fitted. FOUR LEVELING SCREWS. SHIFTING CENTER. Improved CLAMP and TANGENT SCREW with counterspring. Tangent, Clamp and Leveling Screws of nickel silver.

Morocco Finish.

Instrument complete with strong, light, metal base-plate, trivet points, sunshade, plumb bob, magnifying glass, adjusting pins, screw-driver, oil can, brush and waterproof cover, packed in fine polished mahogany Case, and with No. 5178 Split Tripod, each

Weight of instrument with auxiliary telescope about 15 lbs.

Weight of tripod about 10 to 11 lbs.

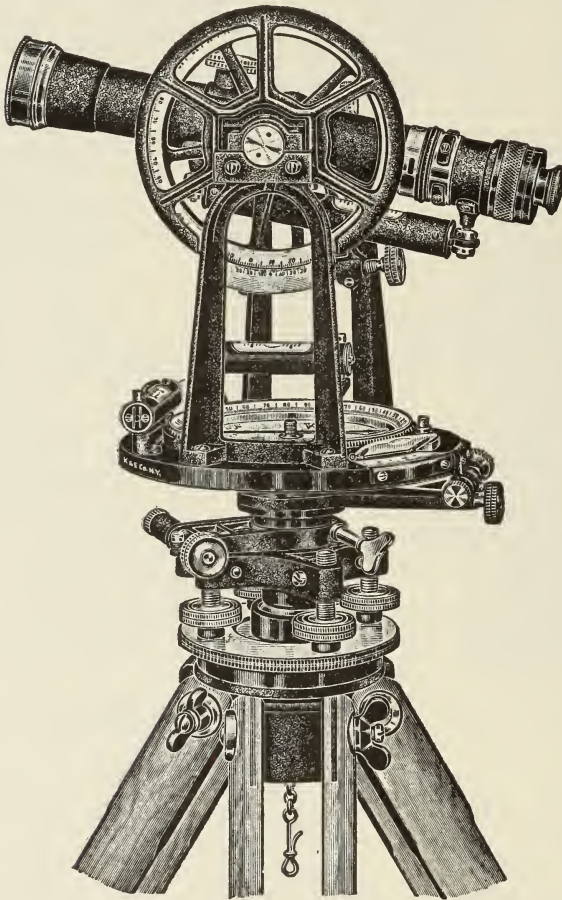
Extension Tripod No. 5180 (see page 438) in place of 5178 at additional charge, each

KEUFFEL & ESSER CO. NEW YORK

K & E

REG. U. S. PAT. OFF.

ENGINEER'S LIGHT MOUNTAIN TRANSIT.



No. 5077F.



K & E

REG. U. S. PAT. OFF.

ENGINEER'S LIGHT MOUNTAIN TRANSIT.

4 $\frac{3}{4}$ INCH HORIZONTAL LIMB.

(For Synopsis of Transits, see page 361).

(See also illustration on page 390).

(For Internal Focusing Telescope, see page 365.)

5077F. K & E ENGINEER'S LIGHT MOUNTAIN TRANSIT with INTERNAL FOCUSING TELESCOPE and VERTICAL CIRCLE.

Telescope 9 $\frac{1}{2}$ in., achromatic terrestrial. OBJECT GLASS 1 $\frac{3}{8}$ in. (effective aperture 1.14 in.). INTERNAL DRAWTUBE with improved spiral toothed rack and pinion movement. EYEPIECE with improved micrometer focusing arrangement with resetting scale. MAGNIFYING POWER 17 diameters. STADIA HAIRS fixed, ratio 1:100 reading direct from the center of the instrument, the constant ($f+c$) being negligible. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 35 seconds of arc per graduation (2mm). Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 4 $\frac{3}{4}$ in. diameter. Graduated on *solid silver* to half degrees and numbered like Fig. IV, page 362. Opposite double-direct VERNIERS at about 30° with telescope, reading to one minute. HINGED IVORY REFLECTORS. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 80 seconds of arc per graduation (2mm).

Compass. GOLD PLATED NEEDLE about 3 in. COMPASS RING beveled, graduated to half degrees. COMPASS BOX cover has glass bezeled into threaded ring, watertight, removable. VARIATION PLATE.

Vertical Circle 4 in. diameter, graduated on *solid silver* to half degrees. DOUBLE DIRECT VERNIER reading to one minute. Removable GUARD to Circle.

Centers, hard bronze anti-friction alloys, extra long and precisely fitted. FOUR LEVELING SCREWS. SHIFTING CENTER. Improved CLAMP and TANGENT SCREW with counterspring. Tangent, Clamp and Leveling Screws of nickel silver.

Morocco Finish.

Instrument complete, with strong, light, metal base-plate, trivet points, sunshade, plumb bob, adjusting pins, screw-driver, oil can, brush and water-proof cover, packed in fine polished mahogany Case, and with No. 5179 Split Tripod. each

Weight of instrument about 10 lbs. Weight of tripod about 9 $\frac{1}{2}$ lbs.

5077FS. K & E ENGINEER'S LIGHT MOUNTAIN TRANSIT, INTERNAL FOCUSING, like No. 5077F, but with K & E Stadia Circle 4 in. diameter instead of vertical circle each

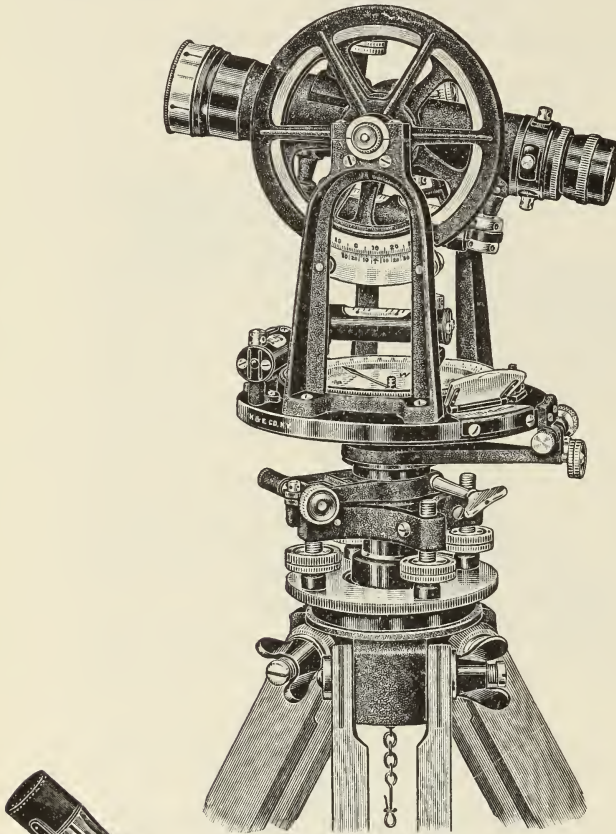
Extension Tripod No. 5181 (see page 438) furnished in place of 5179 at additional charge, each

KEUFFEL & ESSER CO., NEW YORK

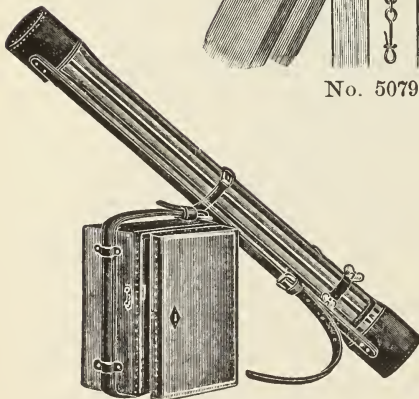
K & E

REG. U. S. PAT. OFF.

ENGINEER'S EXPEDITION TRANSIT.



No. 5079F.



Leather covered case with shoulder strap for transit No. 5079F, and leather skeleton case with shoulder strap for tripod.



K & E

REG. U. S. PAT. OFF.

ENGINEER'S EXPEDITION TRANSIT.

4-INCH HORIZONTAL LIMB.

(For Synopsis of Transits, see page 361).

(For Internal Focusing Telescope, see page 365).

5079F. K & E ENGINEER'S EXPEDITION TRANSIT, with INTERNAL FOCUSING TELESCOPE and VERTICAL CIRCLE.

Telescope $6\frac{1}{2}$ in., achromatic astronomical, (inverting). OBJECT GLASS $1\frac{1}{8}$ in. (effective aperture 1.06 in.). INTERNAL DRAW-TUBE with improved spiral toothed rack and pinion movement. EYEPiece with spiral focusing arrangement. MAGNIFYING POWER 14 diameters. STADIA HAIRS fixed, ratio 1:100 reading direct from the center of the instrument, the constant (f+c) being negligible. Fine SPIRIT LEVEL to telescope graduated on the glass and ground to a sensitiveness of about 35 seconds of arc per graduation (2mm). Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 4 in. diameter, graduated on *solid silver* to half degrees and numbered like Fig. IV, page 362. Opposite VERNIERS at about 30° with telescope, reading to one minute. HINGED IVORY REFLECTORS. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 90 seconds of arc per graduation (2mm).

Compass. GOLD PLATED NEEDLE about $2\frac{3}{4}$ in. COMPASS RING beveled, graduated to half degrees. COMPASS BOX cover has glass bezeled into threaded ring, watertight, removable. VARIATION PLATE.

Vertical Circle $3\frac{1}{2}$ in. diameter, graduated on *solid silver* to half degrees. Double-direct VERNIER reading to one minute. GUARD to Circle.

Centers, hard bronze anti-friction alloys, extra long and precisely fitted. FOUR LEVELING SCREWS. SHIFTING CENTER. Improved CLAMP and TANGENT SCREW with counterspring. Tangent, Clamp and Leveling Screws of nickel silver.

Morocco Finish.

Instrument complete, with strong, light, metal base plate, trivet points, sunshade, plumb bob, adjusting pins, screw-driver, oil can, brush and waterproof cover, fine **leather covered mahogany Case** with shoulder strap, and with No. 5183 Extension Tripod in leather skeleton Case. each

Weight of instrument, about $5\frac{1}{2}$ lbs.: weight of tripod, about 4 lbs.

5079FS. K & E ENGINEER'S EXPEDITION TRANSIT, INTERNAL FOCUSING, like No. 5079F, but with K & E Stadia Circle $3\frac{1}{2}$ in. diam. in place of vertical circle. each

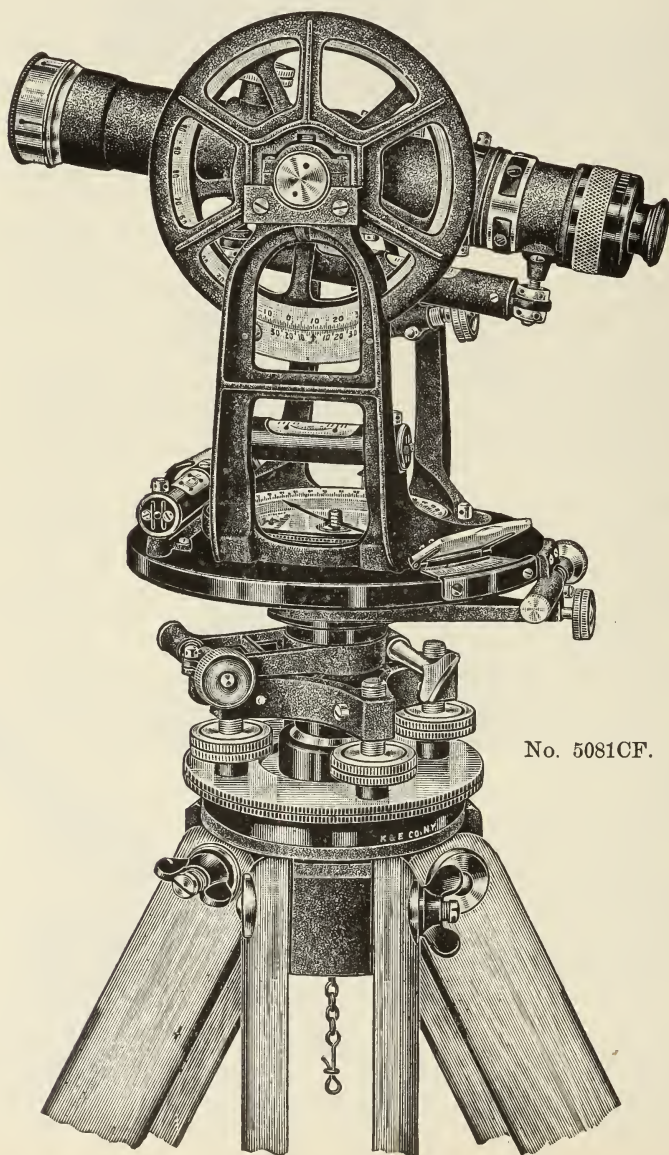
The Expedition Transit is of the same grade and quality as the finest K & E Engineer's transits and of corresponding accuracy. The centers are 3 in. long. It is about 9 in. high, the outer diameter of the horizontal limb is $4\frac{1}{2}$ in., and its case measures about $11 \times 8 \times 6\frac{1}{2}$ in. outside. The tripod can be extended to 59 inches. With the leather-covered case for transit and Sling Case for tripod, this makes the most portable, *accurate* instrument for the many occasions when the combination of these features is of value.

KEUFFEL & ESSER CO., NEW YORK

K & E

REG. U. S. PAT. OFF.

**ENGINEER'S
MOUNTAIN AND MINING TRANSIT.
WITH U STANDARD**



No. 5081CF.

KEUFFEL & ESSER CO., NEW YORK

K & E
REG. U. S. PAT. OFF.

ENGINEER'S MOUNTAIN AND MINING TRANSIT. 5½ INCH HORIZONTAL LIMB. WITH U STANDARD

(For Synopsis of Transits, see page 361).

(For Internal Focusing Telescope, see page 365).

5081CF. K & E ENGINEER'S MOUNTAIN AND MINING TRANSIT with INTERNAL FOCUSING TELESCOPE and VERTICAL CIRCLE.

Telescope 10 in., achromatic terrestrial. OBJECT GLASS 1 $\frac{5}{16}$ in. (effective aperture 1.29 in.). INTERNAL DRAWTUBE with improved spiral toothed rack and pinion movement. EYEPiece with improved micrometer focusing arrangement with resetting scale. MAGNIFYING POWER 20 diameters. STADIA HAIRS fixed, ratio 1:100 reading direct from the center of the instrument, the constant (f+c) being negligible. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation (2mm). Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 5½ in. diameter, graduated on *solid silver* to half degrees and numbered like Fig. IV, page 362. Two opposite double-direct VERNIERS at about 30° with telescope, reading to one minute. HINGED IVORY REFLECTORS. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 75 seconds of arc per graduation (2mm).

Compass. GOLD PLATED NEEDLE about 3 in. COMPASS RING beveled, graduated to half degrees. COMPASS BOX cover has glass beveled into threaded ring, watertight, removable. VARIATION PLATE.

Vertical Circle 4½ in. diameter graduated on *solid silver* to half degrees, double-direct vernier reading to one minute. Removable GUARD to Circle.

Centers, hard bronze anti-friction alloys, extra long and precisely fitted. One piece U Standard. FOUR LEVELING SCREWS. SHIFTING CENTER. Improved CLAMP and TANGENT SCREW with counterspring. Tangent, Clamp and Leveling Screws of nickel silver.

Morocco Finish.

Instrument complete with strong, light, metal base-plate, trivet points, sunshade, plumb bob, magnifying glass, adjusting pins, screw-driver, oil can, brush and waterproof cover, packed in fine polished mahogany Case, with No. 5178 Split Tripod. . . . each

Weight of instrument about 13½ lbs. **Weight** of tripod about 10 to 11 lbs.

5081CFS. K & E ENGINEER'S MOUNTAIN AND MINING TRANSIT, INTERNAL FOCUSING, like No. 5081CF, but with Stadia Circle 4½ in. diameter. . . . each

Extension Tripod No. 5180 (see page 438), furnished in place of 5178 at additional charge, each

For K & E Stadia Circle, see page 414.

For Solar Attachment, see page 410.

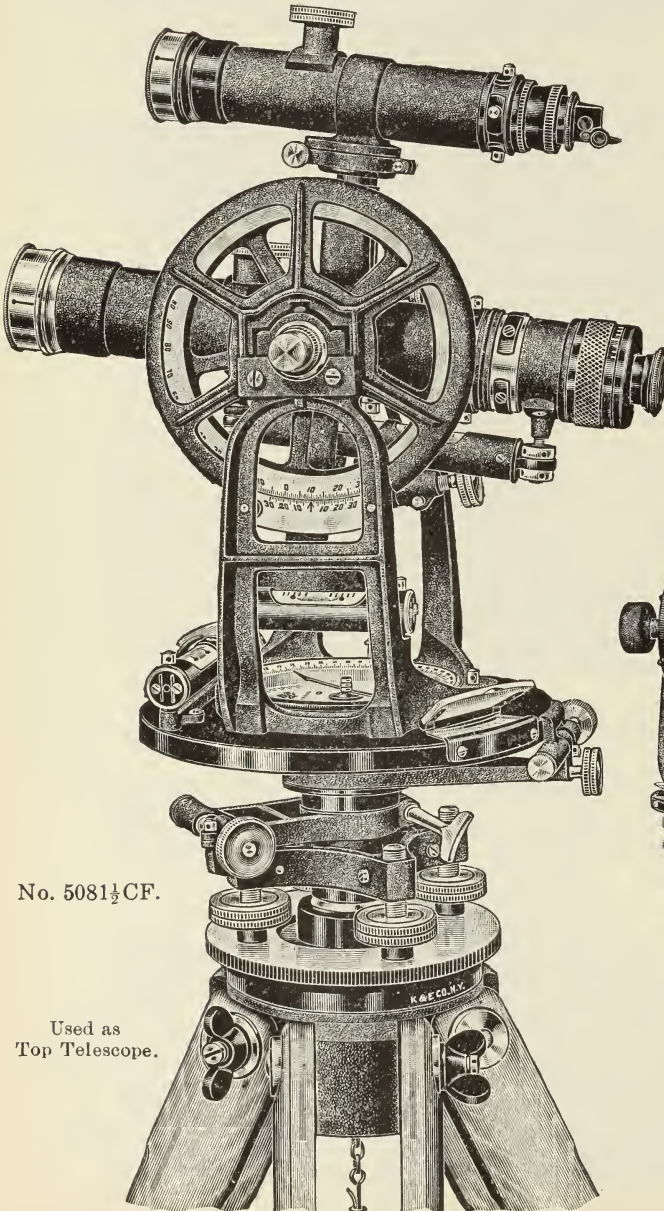
For graduations reading to 20 or 30 seconds, see page 414.

KEUFFEL & ESSER CO., NEW YORK

K & E

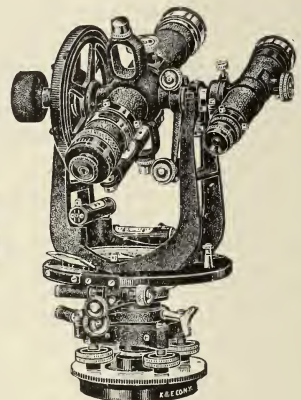
REG. U. S. PAT. OFF.

ENGINEER'S MINING TRANSIT
WITH INTERCHANGEABLE TOP AND SIDE
TELESCOPE AND U STANDARD.



No. 5081 $\frac{1}{2}$ CF.

Used as
Top Telescope.



Used as
Side Telescope.

KEUFFEL & ESSER CO., NEW YORK

K & E

REG. U. S. PAT. OFF.

ENGINEER'S MINING TRANSIT.

5½ INCH HORIZONTAL LIMB.

**WITH INTERCHANGEABLE TOP AND SIDE TELESCOPE
AND U STANDARD**

(For Synopsis of Transits, see page 361).

(For Internal Focusing Telescope, see page 365).

5081½ CF. K & E ENGINEER'S MINING TRANSIT, with INTER- CHANGEABLE TOP AND SIDE TELESCOPE, IN- TERNAL FOCUSING.

Telescope 10 in., achromatic terrestrial. OBJECT GLASS 1½ in. (effective aperture 1.29 in.). INTERNAL DRAWTUBE with improved spiral toothed rack and pinion movement. EYEPIECE with improved micrometer focusing arrangement with resetting scale. MAGNIFYING POWER 20 diameters. STADIA HAIRS fixed, ratio 1:100 reading direct from the center of the instrument, the constant (f+c) being negligible. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation (2mm). Improved CLAMP and TANGENT SCREW with counterspring.

Auxiliary Telescope 6½ in., achromatic astronomical (inverting), Internal Focusing. OBJECT GLASS 1½ in. (effective aperture 1.06 in.) INTERNAL DRAWTUBE with improved spiral toothed rack and pinion movement. EYEPIECE with spiral focusing arrangement. MAGNIFYING POWER 14 diameters. This auxiliary telescope for Vertical Sighting is attachable on one end or on top of the main telescope. Detachable counter weight. The upper post on the telescope axis has center point for plumbing from overhead.

Horizontal Limb 5½ in., diameter, graduated on *solid silver* to half degrees and numbered like Fig. IV, page 362. Two opposite double-direct VERNIERS at about 30° with telescope reading to one minute. HINGED IVORY REFLECTORS. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 75 seconds of arc per graduation (2mm).

Compass. GOLD PLATED NEEDLE about 3 in. COMPASS RING beveled, graduated to half degrees. COMPASS BOX cover has glass bezeled into threaded ring, water-tight, removable. VARIATION PLATE.

Vertical Circle 4½ in. diameter, graduated on *solid silver* to half degrees, double-direct vernier reading to 1 minute. Removable GUARD to Circle.

Centers, hard bronze anti-friction alloys, extra long and precisely fitted. One piece U standard. FOUR LEVELING SCREWS. SHIFTING CENTER. Improved CLAMP and TANGENT SCREW with counterspring. Tangent, Clamp and Leveling Screws of nickel silver.

Morocco Finish,

Instrument complete with strong, light, metal base-plate, trivet points, sunshade, plumb bob, magnifying glass, adjusting pins, screw-driver, oil can, brush and waterproof cover, packed in fine polished mahogany Case, and with No. 5178 Split Tripod . . each

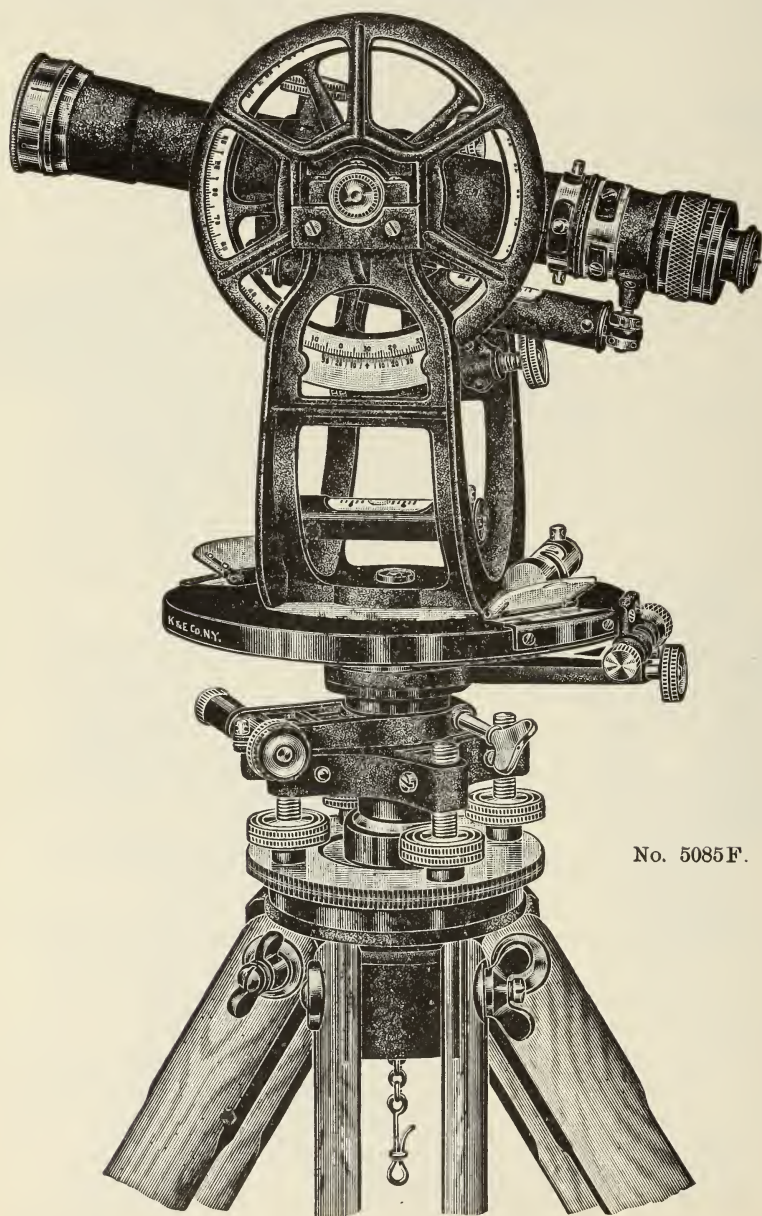
Weight of instrument with auxiliary telescope about 15½ lbs.

Weight of tripod about 10 to 11 lbs.

Extension Tripod No. 5180 (see page 438) furnished in place of 5178 at additional charge, each

KEUFFEL & ESSER CO., NEW YORK

K & E
REG. U. S. PAT. OFF.
CITY ENGINEER'S TRANSIT
WITH U STANDARD.



No. 5085 F.

KEUFFEL & ESSER CO. NEW YORK

K & E
REG. U. S. PAT. OFF.
CITY ENGINEER'S TRANSIT.
6½ INCH HORIZONTAL LIMB.
WITH U STANDARD

(For Synopsis of Transits, see page 361).

(For Internal Focusing Telescope, see page 365.)

5082F. K & E CITY ENGINEER'S TRANSIT, with INTERNAL FOCUSING TELESCOPE.

Telescope 11½ in., achromatic terrestrial. **OBJECT GLASS** 1⅞ in. (effective aperture 1.36 in.). **INTERNAL DRAWTUBE** with improved spiral toothed rack and pinion movement. **EYEPIECE** with improved micrometer focusing arrangement with resetting scale. **MAGNIFYING POWER** 24 diameters. **STADIA HAIRS** fixed, ratio 1:100, reading direct from the center of the instrument, the constant ($f+c$) being negligible. **Fine SPIRIT LEVEL** to telescope, graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation (2mm). Improved **CLAMP** and **TANGENT SCREW** with counterspring.

Horizontal Limb 6½ in. diameter, graduated on *solid silver* to half degrees and numbered like Fig. IV, page 362. Opposite double-direct **VERNIERS**, set at about 30" with telescope, reading to one minute. **HINGED IVORY REFLECTORS**. Two fine **SPIRIT LEVELS** graduated on the glass and ground to a sensitiveness of about 70 seconds of arc per graduation (2mm.)

Centers hard bronze anti-friction alloys, extra-long, and precisely fitted. One piece **U Standard**, **FOUR LEVELING SCREWS**. **SHIFTING CENTER**. Improved **CLAMP** and **TANGENT SCREW** with counterspring. Tangent, Clamp and Leveling Screws of nickel silver.

Morocco Finish.

Instrument complete, with strong, light, metal base-plate, trivet points, sunshade, plumb bob, magnifying glass, adjusting pins, screw-driver, oil can, brush and water-proof cover packed in fine polished mahogany Case, and with No. 5178 Split Tripod . . . each

Weight of instrument about 16 lbs. **Weight** of tripod about 10 to 11 lbs.

***5084F. K & E CITY ENGINEER'S TRANSIT, INTERNAL FOCUSING**, like No. 5082F, but with **Vertical Arc** of 5 in. diameter, graduated on *solid silver* to half degrees, double-direct **VERNIER** reading to one minute. each

Weight of instrument about 16 lbs.

5085F. K & E CITY ENGINEER'S TRANSIT, INTERNAL FOCUSING, like No. 5082F, but with **full Vertical Circle** 5 in. diameter, graduated on *solid silver* to half degrees, double-direct **VERNIER** reading to one minute. **Removable GUARD** to Circle. each

Weight of instrument about 16 lbs.

Extension Tripod No. 5180, (see page 438) furnished in place of No. 5178 at additional charge, each

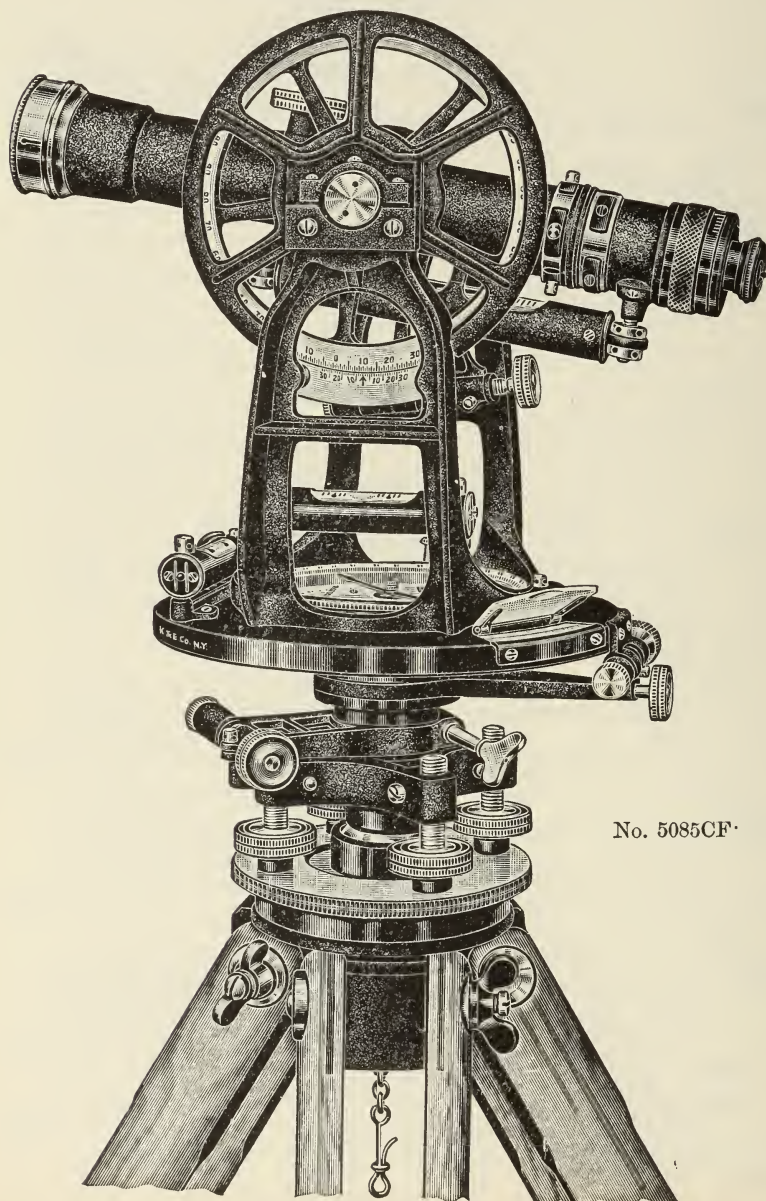
***Made to order only,**

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K & E

REG. U. S. PAT. OFF.

ENGINEER'S TRANSIT
WITH U STANDARD



No. 5085CF.

For description of No. 5085CF, see page 403.
No. 5082CF is like No. 5085CF, without the vertical circle.

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K & E

REG. U. S. PAT. OFF

ENGINEER'S TRANSIT.

6 $\frac{1}{4}$ INCH HORIZONTAL LIMB.

WITH U STANDARD.

5082CF. K & E ENGINEER'S TRANSIT, with INTERNAL FOCUSING TELESCOPE.

Telescope 11 $\frac{1}{2}$ in., achromatic terrestrial. OBJECT GLASS 1 $\frac{7}{8}$ in. (effective aperture 1.36 in.). INTERNAL DRAWTUBE with improved spiral toothed rack and pinion movement. EYEPIECE with improved micrometer focusing arrangement with resetting scale. MAGNIFYING POWER 24 diameters. STADIA HAIRS fixed ratio 1:100, reading direct from the center of the instrument, the constant ($f+c$) being negligible. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation (2mm). Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 6 $\frac{1}{4}$ in. diameter, graduated on *solid silver* to half degrees and numbered like Fig. IV, page 362. Opposite double-direct VERNIERS, set at about 30° with telescope, reading to one minute. HINGED IVORY REFLECTORS. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 70 seconds of arc per graduation (2mm).

Compass. GOLD PLATED NEEDLE about 3 $\frac{3}{4}$ in. COMPASS RING beveled, graduated to half degrees. COMPASS BOX cover has glass bezeled into threaded ring, watertight, removable. VARIATION PLATE.

Centers, hard bronze anti-friction alloys, extra long, and precisely fitted. One piece U Standard. FOUR LEVELING SCREWS. SHIFTING CENTER. Improved CLAMP and TANGENT SCREW with counterspring. Tangent, Clamp and Leveling Screws of nickel silver.

Morocco Finish.

Instrument complete with strong, light, metal base-plate, trivet points, sunshade, plumb bob, magnifying glass, adjusting pins, screw-driver, center key, oil can, brush and waterproof cover, packed in fine polished mahogany Case, and with No. 5178 Split Tripod. each

Weight of instrument about 16 lbs. **Weight** of tripod 10 to 11 lbs.

***5082CFR. K & E ENGINEER'S TRANSIT, INTERNAL FOCUSING,** like No. 5082CF, but with **astronomical** (inverting) eyepiece. MAGNIFYING POWER, 28 diameters. Telescope 12 in. long, with effective aperture of 1.44 in. each

***5084 CF. K & E ENGINEER'S TRANSIT, INTERNAL FOCUSING,** like No. 5082CF, but with **Vertical Arc** 5 in. diameter, graduated on *solid silver* to half degrees, double-direct VERNIER reading to one minute. each

Weight of instrument about 16 lbs.

***5084CFR. K & E ENGINEER'S TRANSIT, INTERNAL FOCUSING,** like No. 5084CF, but with **astronomical** (inverting) eyepiece. MAGNIFYING POWER, 28 diameters. Telescope 12 in. long, with effective aperture of 1.44 in. each

Extension Tripod No. 5180 (see page 438) furnished in place of No. 5178 at additional charge, each

***To order only.**

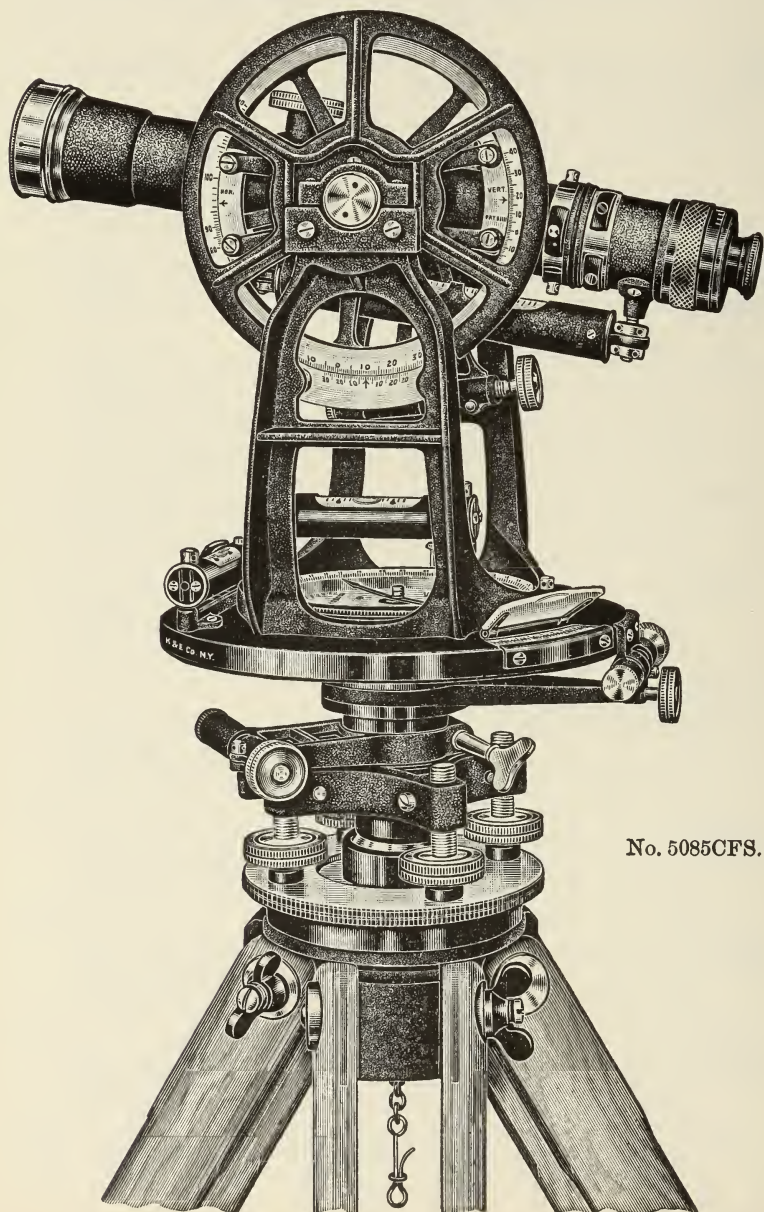
KEUFFEL & ESSER CO., NEW YORK

K & E

REG. U. S. PAT. OFF.

ENGINEER'S TRANSIT

WITH U STANDARD AND STADIA CIRCLE.



No. 5085CFS.

KEUFFEL & ESSER CO., NEW YORK

K & E ENGINEER'S TRANSIT.

6½ INCH HORIZONTAL LIMB.

WITH U STANDARD

5085CF. K & E ENGINEER'S TRANSIT with INTERNAL FOCUSING TELESCOPE and VERTICAL CIRCLE.

Telescope 11½ in., achromatic terrestrial. OBJECT GLASS 1⅞ in. (effective aperture 1.36 in.). INTERNAL DRAWTUBE with improved spiral toothed rack and pinion movement. EYEPIECE with improved micrometer focusing arrangement with resetting scale. MAGNIFYING POWER 24 diameters. STADIA HAIRS fixed, ratio 1:100 reading direct from the center of the instrument, the constant (f+c) being negligible. Fine SPIRIT LEVEL to the telescope, graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation (2mm). Improved CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 6½ in. diameter, graduated on *solid silver* to half degrees and numbered like Fig. IV, page 362. Opposite double-direct VERNIERS at about 30° with telescope, reading to one minute. HINGED IVORY REFLECTORS. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 70 seconds of arc per graduation (2mm).

Compass. GOLD PLATED NEEDLE about 3¾ in. COMPASS RING beveled, graduated to half degrees. COMPASS BOX cover glass beveled into threaded ring, watertight, removable. VARIATION PLATE.

Vertical Circle 5 in. diameter, graduated on *solid silver* to half degrees, double-direct VERNIER reading to one minute. Removable GUARD to CIRCLE.

Centers, hard bronze anti-friction alloys, extra long and precisely fitted. One piece U Standard. FOUR LEVELING SCREWS. SHIFTING CENTER. Improved CLAMP and TANGENT SCREW with counterspring. Tangent, Clamp and Leveling Screws of nickel silver.

Morocco Finish.

Instrument complete, with strong, light, metal base-plate, trivet points, sunshade, plumb bob, magnifying glass, adjusting pins, screw-driver, center key, oil can, brush and waterproof cover packed in fine polished mahogany Case and with No. 5178 Split Tripod. each

Weight of instrument about 16½ lbs. Weight of tripod about 10 to 11 lbs.

*5085CFR. K & E ENGINEER'S TRANSIT, INTERNAL FOCUSING, like No. 5085CF, but with astronomical (inverting) eyepiece. MAGNIFYING POWER 28 diameters. Telescope 12 in. long, with effective aperture of 1.44 in. each

5085CFS. K & E ENGINEER'S TRANSIT, INTERNAL FOCUSING, like No. 5085CF, but with K & E Stadia Circle 5 in. diameter, in place of vertical circle. each

*5085CFRS. K & E ENGINEER'S TRANSIT, INTERNAL FOCUSING, like No. 5085CFS, but with astronomical (inverting) eyepiece. MAGNIFYING POWER, 28 diameters. Telescope 12 in. long, with effective aperture of 1.44 in. each

Extension Tripod No. 5180 (see page 438) furnished in place of 5178 at additional charge, each

*Made to order only.

For graduations reading to 20 or 30 seconds, see page 414.

For K & E Stadia Circle, see page 414.

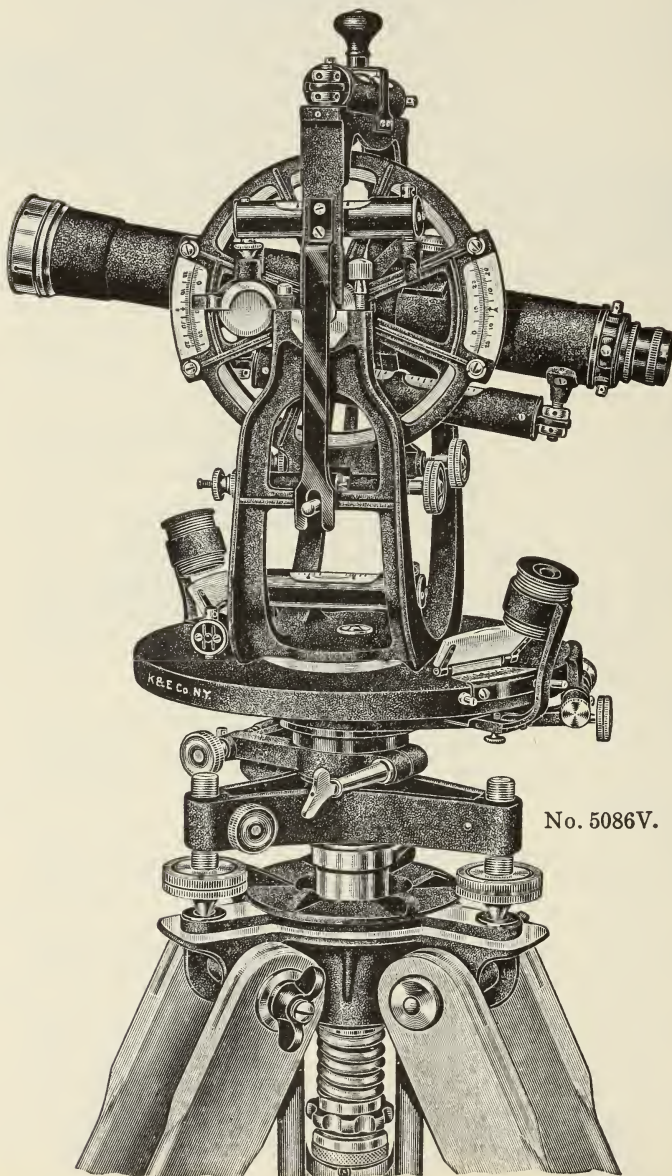
For Internal Focusing Telescope, see page 365.

KEUFFEL & ESSER CO. NEW YORK

K & E

REG. U. S. PAT. OFF.

**MUNICIPAL
TRIANGULATION THEODOLITE.
THREE LEVELING SCREWS.**



KEUFFEL & ESSER CO., NEW YORK

K & E

REG. U. S. PAT. OFF.

MUNICIPAL TRIANGULATION THEODOLITE.

7 INCH HORIZONTAL LIMB.

5086V. K & E MUNICIPAL TRIANGULATION THEODOLITE, INTERNAL FOCUSING, with VERTICAL CIRCLE.

Telescope 12 in., achromatic astronomical (inverting). INTERNAL FOCUSING, with spiral toothed rack and pinion movement. One achromatic eyepiece having a MAGNIFYING POWER of about 28 diameters. OBJECT GLASS $1\frac{1}{2}$ in. diameter (effective aperture 1.44 in.). STADIA HAIRS fixed, ratio 1:100, reading direct from center of instrument, the constant ($f + c$) being negligible. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 20 seconds of arc per graduation. STRIDING SPIRIT LEVEL to telescope, bearing directly on the telescope axle, graduated on the glass and ground to a sensitiveness of about 20 seconds of arc per graduation. The telescope transits through its standards in the usual way and in addition the axle can be reversed in its bearings. It is provided with REVERSIBLE CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb, 7 in. diameter, graduated on *solid silver* to ten minutes and numbered like Fig. IV, page 362. Opposite DOUBLE DIRECT VERNIERS at about 30° with telescope reading to ten seconds. MOUNTED MAGNIFIERS to verniers. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 50 seconds of arc per graduation.

Vertical Circle, 5 in. diameter, graduated on *solid silver* to twenty minutes. Opposite DOUBLE DIRECT VERNIERS reading to thirty seconds. GUARD to CIRCLE. CONTROL LEVEL to verniers. REVERSIBLE TANGENT SCREW with counterspring to vernier.

Centers, hard bronze anti-friction alloys, extra long and precisely fitted. One piece U Standard mounted directly on flange of inner center. THREE LEVELING SCREWS. SHIFTING CENTER. Improved CLAMP and TANGENT SCREW with counterspring. Tangent, Clamp and Leveling Screws of nickel silver.

Morocco Finish.

Instrument complete, with sunshade, plumb bob, adjusting pins, screw-driver, center key, oil can, brush, and waterproof cover packed in fine polished mahogany Case, and with fine Split Tripod. each

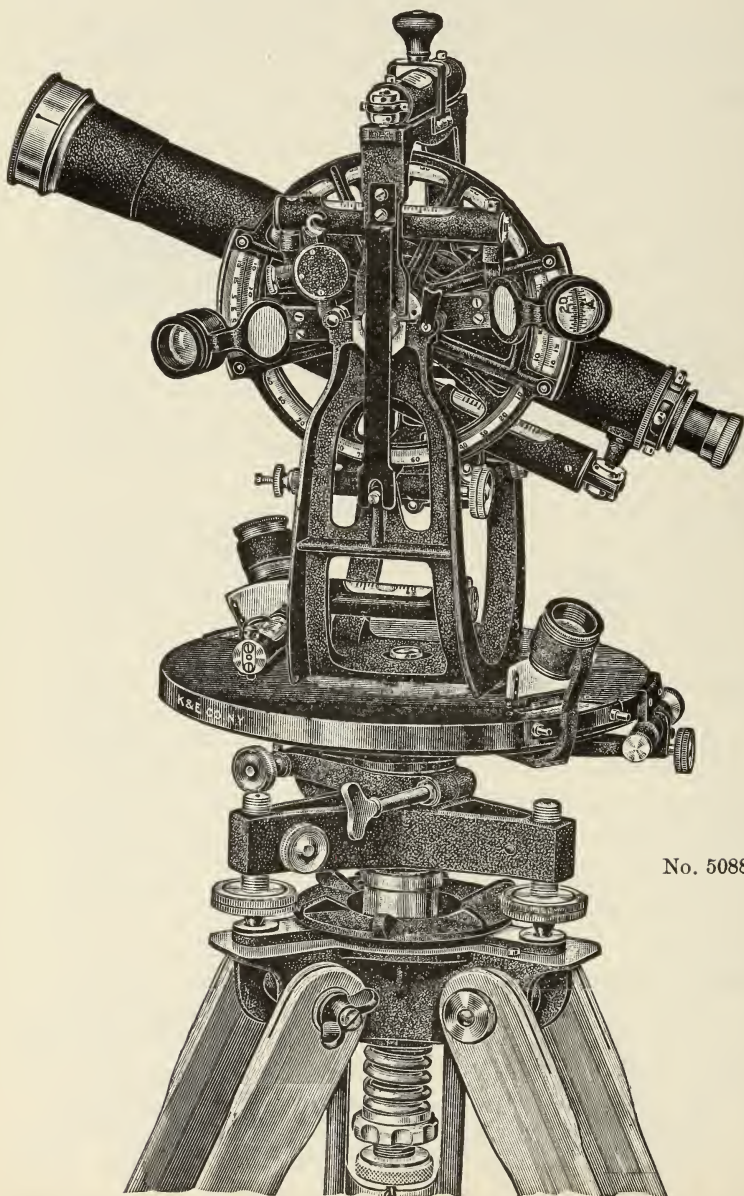
Weight of instrument about 19 lbs. **Weight** of tripod about 14 lbs.

5086P. K & E MUNICIPAL TRIANGULATION THEODOLITE, INTERNAL FOCUSING, like No. 5086 V, but without vertical circle. each

KEUFFEL & ESSER CO., NEW YORK

K & E
REG. U. S. PAT. OFF.

REPEATING THEODOLITE.
THREE LEVELING SCREWS.



No. 5088



K & E

REG. U. S. PAT. OFF.

REPEATING THEODOLITE.

FOR TRIANGULATION

8 INCH HORIZONTAL LIMB.

UNIVERSAL INSTRUMENT.

5088. K & E TRIANGULATION THEODOLITE, INTERNAL FOCUSING with VERTICAL CIRCLE.

Telescope 13½ in., achromatic astronomical (inverting), INTERNAL FOCUSING. OBJECT GLASS 1½ in. diameter (effective aperture 1.60 in.). INTERNAL DRAWTUBE with improved spiral toothed rack and pinion movement. Two achromatic eyepieces having a MAGNIFYING POWER of 24 and 32 diameters. STADIA HAIRS fixed, ratio 1:100, reading direct from center of the instrument, the constant ($f+c$) being negligible. Fine SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 20 seconds of arc per graduation (2mm). STRIDING SPIRIT LEVEL to telescope axis, graduated on the glass and ground to a sensitiveness of about 20 seconds of arc per graduation (2mm). The telescope transits through its standards in the usual way, and in addition the axle can be reversed in its bearings. It is provided with REVERSIBLE CLAMP and TANGENT SCREW with counter-spring.

Horizontal Limb, 8 in. diameter, graduated on *solid silver* to ten minutes and numbered like Fig. IV, page 362. Opposite DOUBLE DIRECT VERNIERS at about 30° with telescope reading to ten seconds. MOUNTED MAGNIFIERS to verniers. Two fine SPIRIT LEVELS graduated on the glass and ground to a sensitiveness of about 40 seconds of arc per graduation (2mm).

Vertical Circle, 5½ in. diameter, graduated on *solid silver* to fifteen minutes. Opposite DOUBLE DIRECT VERNIERS reading to twenty seconds. GUARD to Circle. CONTROL LEVEL to Verniers. MOUNTED MAGNIFIERS to verniers. REVERSIBLE TANGENT SCREW with counterspring to verniers.

Centers, hard bronze anti-friction alloys, extra long and precisely fitted. One piece U Standard mounted directly on flange of inner center. THREE LEVELING SCREWS. SHIFTING CENTER. Improved CLAMP and TANGENT SCREW with counterspring. Tangent, Clamp and Leveling Screws of nickel silver.

Morocco Finish.

Instrument complete, with sunshade, plumb bob, adjusting pins, screw-driver, oil can, brush and waterproof cover packed in two fine polished mahogany Cases, and with fine Split Tripod. each

Weight of instrument about 23 lbs.

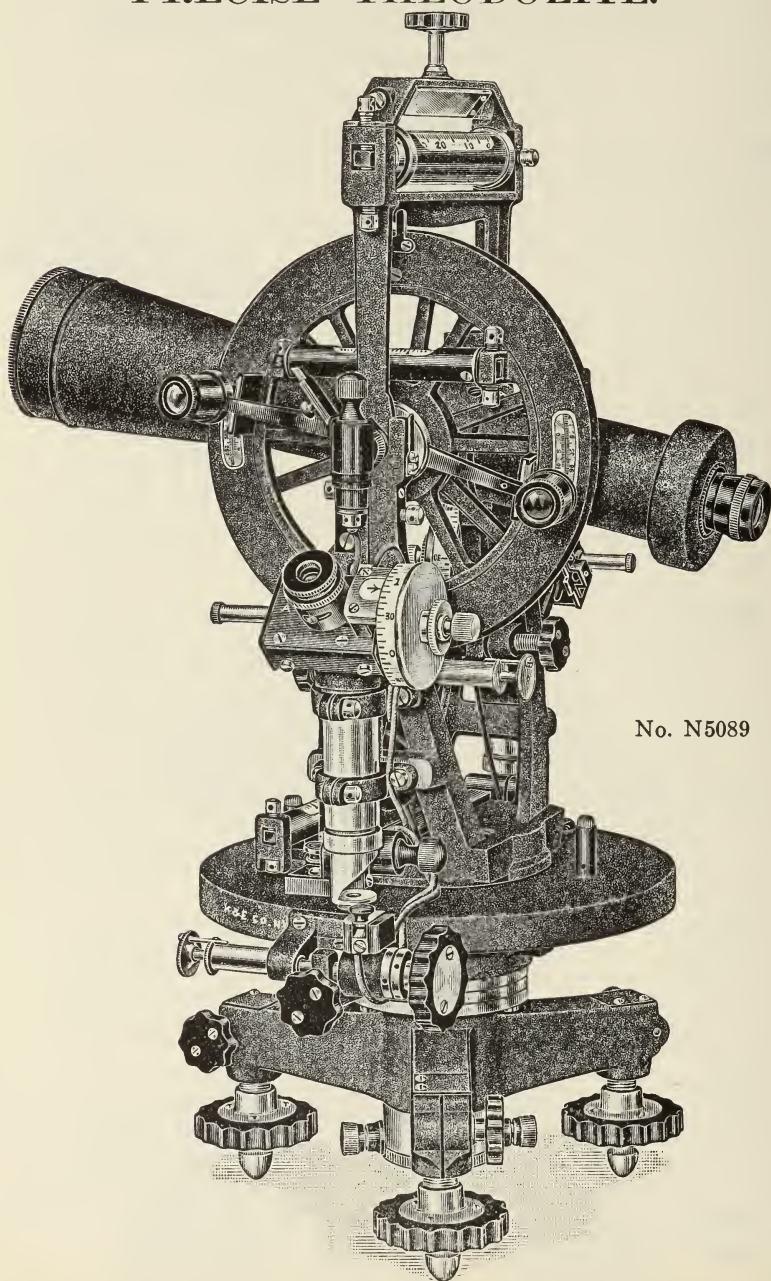
Weight of tripod about 14 lbs.

KEUFFEL & ESSER CO., NEW YORK

K & E

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PRECISE THEODOLITE.



No. N5089

KEUFFEL & ESSER CO., NEW YORK

K & E

REG. U. S. PAT. OFF.

PRECISE THEODOLITE

FOR TRIANGULATION

AS MADE FOR U. S. COAST AND GEODETIC SURVEY.

6½ INCH HORIZONTAL LIMB.

N5089. 6½ INCH TRIANGULATION THEODOLITE WITH INTERNAL FOCUSING TELESCOPE.

Telescope 13 in. achromatic astronomical (inverting). INTERNAL FOCUSING. OBJECT GLASS 2 in. (effective aperture 1.90 in.). INTERNAL DRAWTUBE with improved spiral toothed rack and pinion movement. Two achromatic EYEPIECES with spiral focusing arrangement. MAGNIFYING POWERS 25 and 37 diameters. Strong telescope axis with STEEL TRUNNIONS in wide bearings with quick release locking device. Fine STRIDING SPIRIT LEVEL (chambered), graduated on the glass and ground to a sensitiveness of about 8 seconds of arc per graduation (2mm). REFLECTING MIRROR for observing spirit level. The telescope transits through its standards at the eye end, and in addition the axle can be reversed in its bearings. Rotatable REFLECTOR inside telescope at intersection of horizontal and telescope axes for illumination of cross hairs. REVERSIBLE CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 6½ in. diameter, graduated on *solid silver* to ten minutes. Opposite FILAR MICROMETER MICROSCOPES reading to five seconds, on special white drums which may be illuminated internally for night reading. The graduations on the drums are such that seconds may easily be estimated. Rigidly mounted and so adjusted that one full turn of the screw covers one division of the horizontal limb. INNER CIRCLE, for approximate setting, graduated to read by VERNIER to five minutes. Fine SPIRIT LEVEL graduated on the glass, and ground to a sensitiveness of about 12 seconds of arc per graduation (2mm).

Vertical Circle, 5½ in. diameter, graduated on *solid silver* to ten minutes. Opposite VERNIERS reading to ten seconds. GUARD to CIRCLE. CONTROL LEVEL to verniers. MOUNTED MAGNIFIERS to verniers. REVERSIBLE TANGENT SCREW with counterspring to verniers.

Centers: steel and cast iron; special design. One piece U standard mounted directly on flange of inner center. THREE LEVELING SCREWS. Ball bearing equipped CLAMP and TANGENT SCREW with counterspring. Clamp and Tangent Screws of nickel silver. Leveling Screws of steel.

Illumination: Wired for illumination of cross-hairs and microscopes. **Morocco Finish.**

Instrument complete, with sunshade, plumb bob, adjusting pins, waterproof cover, etc., packed in strong Case and strong outer packing case with spring buffers, affording full protection to instrument while in transit, and with very rigid Split Tripod. each

Weight of theodolite about 22 lbs. **Weight** of tripod about 14 lbs.

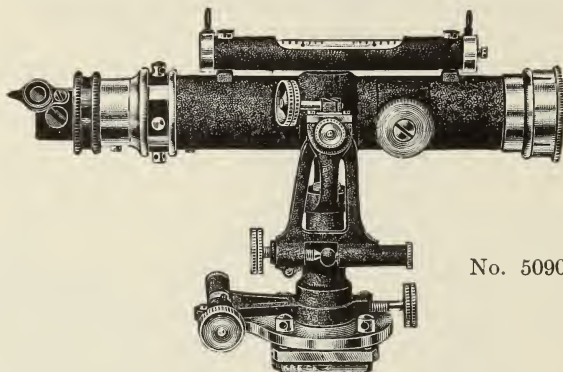
NOTE: This instrument is manufactured by us according to the designs of the U. S. Coast and Geodetic Survey. Every part of the instrument is made by us, including the special centers, the limb and circle with their graduations, the micrometer microscopes, the high grade telescope, etc. Consequently, the instrument throughout is guaranteed to be the highest quality, both as to materials and workmanship.

KEUFFEL & ESSER CO., NEW YORK

K & E

REG. U. S. PAT. OFF.

SOLAR ATTACHMENT.



No. 5090

5090 SOLAR ATTACHMENT.

Telescope, 6 in. astronomical (inverting) with dust cap. **OBJECT GLASS** $\frac{13}{16}$ in. (effective aperture 0.7 in.) with improved rack and pinion movement. **EYEPIECE**, with prism and colored glass, and spiral focusing arrangement. **MAGNIFYING POWER** about 12 diameters. **SPIRIT LEVEL** to telescope, graduated on the glass, with pointers so placed that when the shadow of one of them falls upon the other, the sun is in the field of view. Improved **CLAMP** and **TANGENT SCREW** with counterspring.

Azimuth Motion controlled by **CLAMP** and **TANGENT SCREW** with counterspring.

Standard, Y SHAPE.

Base designed that by release of one clamp screw the instrument may be immediately removed from the transit.

Instrument complete with bracket for holding in instrument case; the price including mounting of base on main telescope if ordered with transit, with directions each

NOTE: Transits Nos. 5070F, 5070FS, 5071F, 5071FS, 5076F, 5076FS, 5077F, 5077FS, 5081CF and 5081CFS are provided with screws for attaching solar attachment No. 5090. This solar attachment can be furnished with any of our other transits except No. 5079F. No. 5090 can also be attached to old transits of nearly every make at a reasonable cost.

Astronomical meridian, latitude and time may be obtained with this Solar Attachment with great accuracy by a simple operation explained in the directions. It serves also as a vertical sighting telescope.

It consists of a small telescope with prism to eyepiece, mounted in a Y-shaped standard which revolves upon a vertical axis attached on top of the telescope of the transit. This small telescope, called the solar telescope, is capable of rotation in altitude and azimuth, slow motion being imparted to it in either direction by means of tangent screws. The vertical axis, called the polar axis, can be inclined to correspond with the axis of the earth's rotation by inclining the transit telescope to which it is attached, the vertical limb giving the inclination.

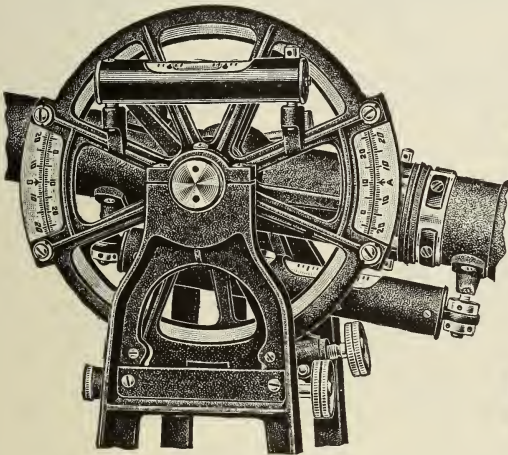
SOLAR EPHEMERIS.

K & E Co. publish annually a Solar Ephemeris, vest pocket size, containing those data from the Nautical Almanac which are used in solar and Polaris observations. Included are many other astronomical tables compiled for the convenience of our customers; also a treatise on the more important surveying instruments and the methods of adjusting them. Additional matter covers a discussion of the problems of field astronomy; logarithms of numbers up to 1000; natural values of functions; logarithms of functions; trigonometric formulas, etc. This valuable and unique booklet furnished free of charge.

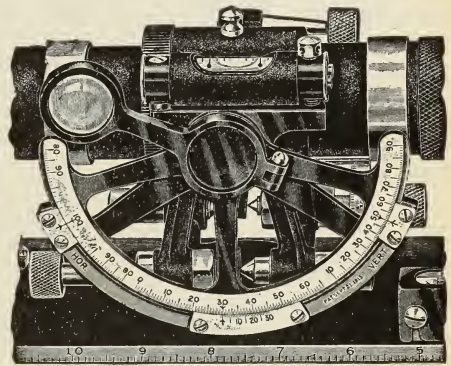
KEUFFEL & ESSER CO., NEW YORK

MODIFICATIONS AND ADDITIONS
K & E AND Y & S
REG. U. S. PAT. OFF. REG. U. S. PAT. OFF.
TRANSITS, LEVELS AND ALIDADES.

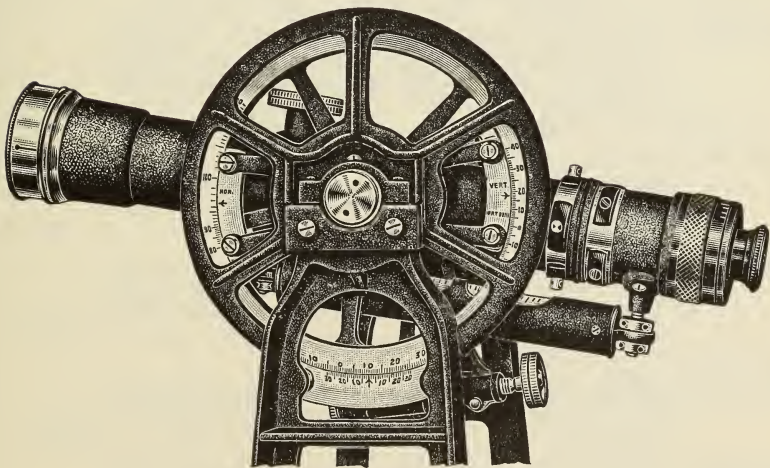
See List on Pages 412 to 414.



No. 5097-43.



Stadia Arc
(Alidades only)



No. 5097S
(Transits only)

KEUFFEL & ESSER CO., NEW YORK

MODIFICATIONS AND ADDITIONS

K & E AND Y & S

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TRANSITS, LEVELS AND ALIDADES.

The prices covering the following items are approximate, and represent the increase in cost of an instrument when it is made to order with the attachments or modifications here listed. Applying these extras to a finished instrument, if they can be applied at all, may involve more work and consequent additional expense.

- 5097-40. Guard to vertical circle. each
- 5097-43. Vertical Circle, 5 in. dia., with opposite Verniers and Guard,
Control Level and Tangent Screw, in place of regular
vertical circle (see page 411) each
- 5097-46. Prism and Colored Glass with Cap to eyepiece (see illustra-
tion, page 396). each
- 5097-47. Focus Reducing Lens for sighting near objects. each
- 5097-48. do. do. do. do. set of two lenses. set

The range of adjustment for focus of telescopes of K & E transits and levels permits sighting objects as near as 8 to 10 times the focal length of the object glass. To sight nearer objects, focus reducing lenses, which are slipped over the object glass like a cap, can be furnished. Lens No. 5097-47 shortens the range to about 6 to 7 times the focal length of the objective and when used with the additional lens (the combination constituting No. 5097-48) the range is shortened to about 4 to 5 times the focal length of the objective.

In ordering these lenses, give the serial number of the instrument.

- 5097-49A. Diaphragm with one vertical and one horizontal cross-
hair, if not regularly furnished with new instrument. . . each
- 5097-49B. Diaphragm with one horizontal and two vertical cross-
hairs. Space between vertical cross-hairs subtends 30
seconds of arc. each
- 5097-49C. Diaphragm with regular cross and fixed stadia hairs, if
not regularly furnished with new instrument. each
- No. 5097-49C is old No. 5097-49.
- 5097-49D. Diaphragm with regular cross-hairs only in one plane,
and the stadia hairs only in another plane. The
cross-hairs will not be visible when the stadia hairs are
in focus. each
- No. 5097-49D is old No. 5097-53.
- 5097-49E. Diaphragm with regular cross-hairs in one plane and
regular cross-hairs with stadia hairs in another plane.
The cross-hairs will thus be always in view, whether
the stadia hairs are in view or not. each
- 5097-49F. Diaphragm with regular cross-hairs and three fixed stadia
hairs, one of which is a $\frac{1}{4}$ interval hair in the upper
half of the field, if not regularly furnished with a
new instrument. each
- No. 5097-49F is old No. 5097-50.
- 5097-49G. Diaphragm with regular cross and stadia hairs and two
diagonal hairs set at 35 or 45 degrees to the vertical,
as specified. each
- 5097-49H. Diaphragm with regular cross and stadia hairs and solar
square. each
- 5097-49K. Diaphragm for Solar Attachment No. 5090. each



CROSS-HAIR DIAPHRAGMS.



5097-49A*



5097-49B



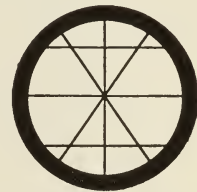
5097-49C†



5097-49D



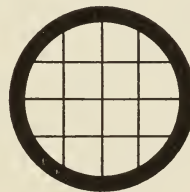
5097-49F



5097-49G



5097-49H



5097-49K

*Unless otherwise ordered, all levels except Nos. 5024, 5026 and N5027 are regularly furnished with No. 5097-49A.

†Unless otherwise ordered all Engineer's Transits are regularly furnished with No. 5097-49C.

MODIFICATIONS AND ADDITIONS (Continued.)

- 5097-57. Clamp and Tangent screw with Gradienter in place of regular clamp and tangent screw. each
 5097-62. Mounted Magnifier to vernier. (see illustration, page 408) . . . "
 5097-63. Mounted Reading Glass for Horizontal Limb of Transits.
 Recommended where verniers read to 20 or 30 seconds
 (see illustration, page 386) per pair
 5097-70. Horizontal limb graduated 20 minutes to read to 30 seconds. . each
 5097-71A. " " " 15 " " " " 20 " "
 5097-71B. " " " 20 " " " " 20 " "
 5097-72. " " " 10 " " " " 10 " "
 5097-73. " " " 20 " " " " 30 " "
 5097-74. Vertical limb, " " " 15 " " " " 20 " "

(See illustrations, pages 363 and 364).

Graduations to read to 20 seconds should be applied **only** to K & E Engineer's Transits. Graduations to read to 10 seconds should be applied **only** to 7 in. and 8 in. theodolites.

- 5097-75. Reversible Spirit Level attached to Transit Telescope in place of regular level. each
 5097-76. Side Mirror for level, by which the image of the bubble may be observed while sighting through the telescope, (specify whether mirror is to be at observer's right or left hand when sighting. See illustration, page 372) each
 5097S. K & E Stadia Circle (see illustration, page 411) "
 K & E Stadia Arc (see illustration, page 411) "

The K & E Stadia Circle and the K & E Stadia Arc, facilitate the computation of the horizontal and vertical components of observed stadia distances. They are modifications of the regular vertical circle and vertical arc.

Special graduations are so spaced that they give directly the reduction factors by which the stadia distance is to be multiplied in order to obtain its horizontal and vertical components. The reading of the vertical angle is unnecessary. The calculations are reduced to simple multiplications.

The cuts on page 411 illustrate the K & E Stadia Circle as applied to Engineers' Transits, and the K & E Stadia Arc as applied to Plain Table Alidades Nos. 5187A and 5189A. On the Stadia Circle the degree graduations occupy the face at the outside circumference of the ring in four full quadrants, and the special graduations occupy the face at the inside circumference. On the Stadia Arc both sets of graduations occupy the face at the outside circumference, the degree graduations occupying 65 degrees at the middle, and the special graduations occupying the equivalent of $26\frac{1}{2}$ degrees, both in elevation and depression, at either end of the arc. The zero of the vernier of the Stadia Arc reads 30 degrees when the telescope is level, and 30 is subtracted from the number of degrees read. This saves time and avoids errors.

Each of the special sets of graduations has an index. At the left index, marked "Hor.," is read the multiplier which is to be applied to the stadia distance to obtain the horizontal distance. At the right index, marked "Vert.," is read the multiplier which is to be applied to the stadia distance to obtain the difference in elevation. On the K & E Stadia Arc, graduation 50 on the "Vert." side is opposite the index when the telescope is level. Any reading under 50 indicates a depressed sight, and any reading over 50 an elevated sight. The correct multiplier is found by subtracting 50 from the "Vert." reading. On the Stadia Circle the multiplier is used as read.



Y & S

REG. U. S. PAT. OFF.

TRANSITS AND LEVELS.

Made by

Y & S DEPARTMENT OF KEUFFEL & ESSER CO.

The **Y & S Department** developed from our purchase of the long established business of Young & Sons, Inc., Philadelphia.

That Company had been manufacturing Surveying Instruments of good quality for a period of over 100 years; and were, in fact, the originators of the American Engineer's type of Transit.

We have established in our factory a special **Y & S** department and continue the manufacture of **Y & S** instruments which, while they do not possess many of the refinements and exclusive features of the **K & E Engineer's** Transits and Levels, are of simple and substantial construction and meet the demand for reliable instruments at moderate prices.

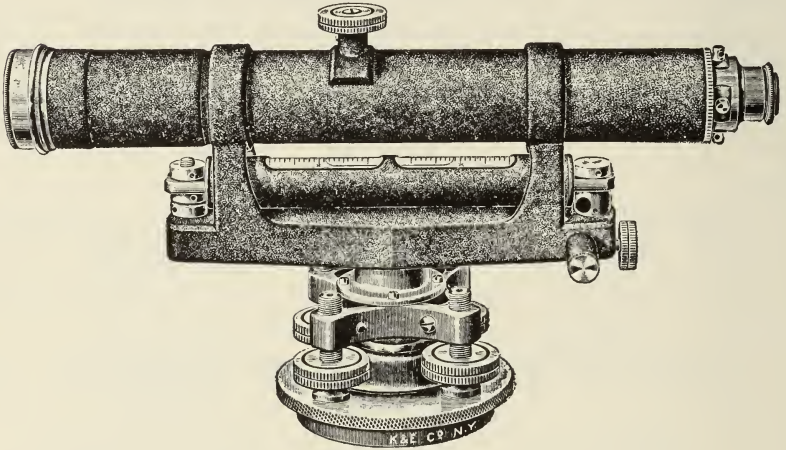


Y & S

REG. U. S. PAT. OFF.

DUMPY LEVEL.

(For Synopsis of Levels, see page 360).



No. Y 5118.

Y5119 Y & S DUMPY LEVEL.

Telescope $13\frac{1}{2}$ in., achromatic terrestrial (erecting), **OBJECT GLASS** $1\frac{3}{8}$ in. (effective aperture 1.30 in.), with improved rack and pinion movement. **EYEPIECE**, with spiral adjustment for focusing cross hairs. **MAGNIFYING POWER** 24 diameters. **SPIRIT LEVEL** extra long, graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation (2 mm).

Level Bar, unique design, allowing use of spirit level of unusual length, and combining great strength and stability.

Morocco Finish.

Center of hard bell metal, carefully fitted. Level bar and center are cast in one piece. Improved **CLAMP** and **TANGENT SCREW** with counterspring. **FOUR LEVELING SCREWS.**

Instrument complete, with sunshade, adjusting pins and waterproof cover, in hardwood Case, and with No. 5174 Tripod. . . . each

Weight of instrument about $6\frac{1}{2}$ lbs. Weight of tripod about 7 lbs.

Y5118. Y & S DUMPY LEVEL, like No. Y 5119, but with astronomical (inverting) telescope 12 in. long. **MAGNIFYING POWER** 24 diameters. Effective aperture 1.38 in. each

Weight of instrument about $6\frac{1}{2}$ lb. Weight of tripod about 7 lbs.

Extension Tripod No. 5181 (page 438) furnished in place of No. 5174 at additional charge each

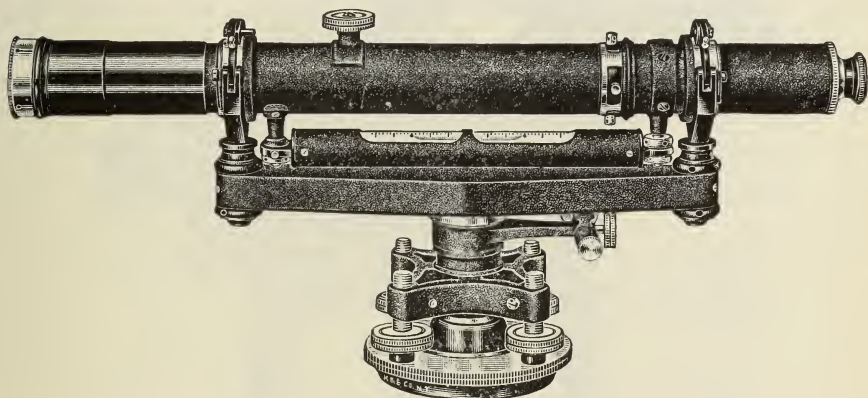
KEUFFEL & ESSER CO., NEW YORK

Y & S

REG. U. S. PAT. OFF.

ENGINEER'S Y LEVEL.

(For Synopsis of Levels, see page 360).



No. Y 5120. Y & S ENGINEER'S Y LEVEL.

Telescope 18 in., achromatic terrestrial. **OBJECT GLASS** $1\frac{3}{8}$ in. (effective aperture 1.38 in.), focused by improved rack and pinion movement. **EYEPiece**, erecting with spiral focusing arrangement. **MAGNIFYING POWER** about 28 diameters. **SPIRIT LEVEL** to telescope 6 in. long, graduated on the glass and ground to a sensitiveness of about 30 seconds of arc per graduation (2 mm). Level tube adjustable vertically and horizontally.

Level Bar of strong construction. Telescope sets low in Y's and close to the bar. One Y can be raised and lowered. A stop insures the horizontal position of the cross hairs. The Y's are locked by an improved arrangement dispensing with pinbolts.

Center of anti-friction composition, heavy, extra long and carefully fitted. Improved **CLAMP** and **TANGENT SCREW** with counter spring. **FOUR LEVELING SCREWS**.

Morocco Finish.

Instrument complete with sunshade, adjusting pins and waterproof cover, in hardwood case, with hardwood Split Tripod No. 5178. . . each

Weight of Instrument about $10\frac{1}{2}$ lbs. **Weight** of Tripod about 10 to 11 lbs.

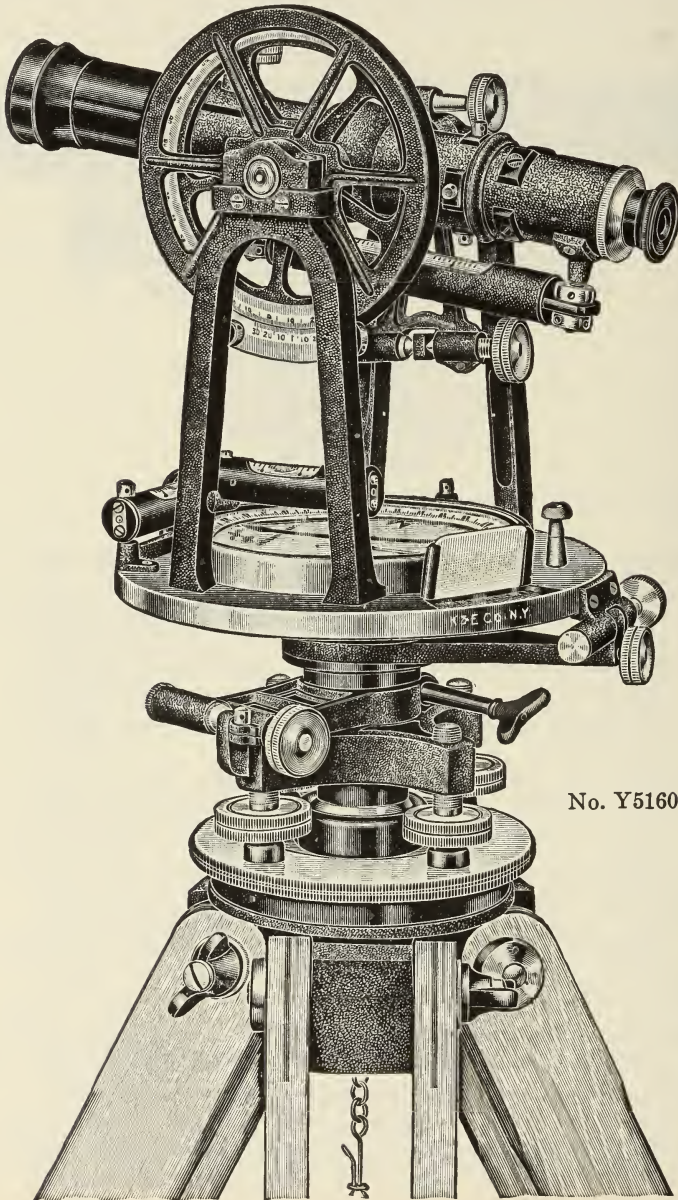
Extension Tripod No. 5180 (page 438) furnished in place of No. 5178 at additional charge, each

KEUFFEL & ESSER CO., NEW YORK

Y & S

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ENGINEER'S TRANSIT.



No. Y5160.

KEUFFEL & ESSER CO., NEW YORK

Y & S

REG. U. S. PAT. OFF.

ENGINEER'S TRANSITS.

6½ INCH HORIZONTAL LIMB.

(For Synopsis of Transits, see page 361).

No. Y5160. Y & S ENGINEER'S TRANSIT with VERTICAL CIRCLE.

Telescope 11½ in., achromatic terrestrial, with dust cap. **OBJECT GLASS** 1⅞ in. (effective aperture 1.22 in.), with improved rack and pinion movement. **EYEPiece** with spiral focusing arrangement. **MAGNIFYING POWER** about 24 diameters. **STADIA HAIRS** fixed, ratio 1:100. **SPIRIT LEVEL** to telescope, graduated on the glass and ground to a sensitiveness of about 40 seconds of arc per graduation (2mm). Improved **CLAMP** and **TANGENT SCREW** with counterspring.

Horizontal Limb 6½ in. diameter. Graduated on solid silver to half degrees and numbered like Fig. IV, page 362. Opposite double-direct **VERNIERS** at about 30° with telescope, reading to one minute, with reflectors. Two **SPIRIT LEVELS** graduated on the glass and ground to a sensitiveness of about 80 seconds of arc per graduation (2mm).

Compass. **NEEDLE** about 4½ in. **COMPASS RING**, graduated to half degrees, can be revolved to set off **VARIATION** of needle.

Vertical Circle 5 in. diameter, graduated on solid silver to half degrees. Double-direct **VERNIER** reading to one minute. Removable **GUARD** to circle.

Centers, anti-friction composition, extra long and carefully fitted. **FOUR LEVELING SCREWS.** **SHIFTING CENTER.** Improved **CLAMP** and **TANGENT SCREW** with counterspring.

Instrument Complete, with strong, light, metal base-plate, trivet points, sunshade, plumb bob, magnifying glass, adjusting pin and waterproof cover, packed in hardwood Case, and with hardwood Split Tripod No. 5178. each

Weight of Instrument about 14½ lbs. **Weight of Tripod** about 10 to 11 lbs.

No. Y5160S. Y & S ENGINEER'S TRANSIT, like No. Y5160, but with K & E Stadia Circle 5 in. dia. instead of vertical circle. . . each

No. Y5165. Y & S ENGINEER'S MOUNTAIN TRANSIT, as described under No. Y5160 but smaller model.

Telescope 9 in. **OBJECT GLASS** 1½ in. (effective aperture 1.06 in.). **MAGNIFYING POWER** about 18 diameters.

Horizontal Limb 5½ in. diameter.

Compass. **NEEDLE** about 3½ in.

Vertical Circle 4 in. diameter. Removable **GUARD** to circle.

Instrument complete, with strong, light, metal base-plate, trivet points, sunshade, plumb bob, magnifying glass, adjusting pin, and waterproof cover, packed in hardwood Case and with hardwood Split Tripod No. 5178. each

Weight of Instrument about 11½ lbs. **Weight of Tripod** about 10 to 11 lbs.

No. Y5165S. Y & S ENGINEER'S MOUNTAIN TRANSIT, like No. Y5165, but with K & E Stadia Circle 4 in. dia. in place of Vertical Circle. each

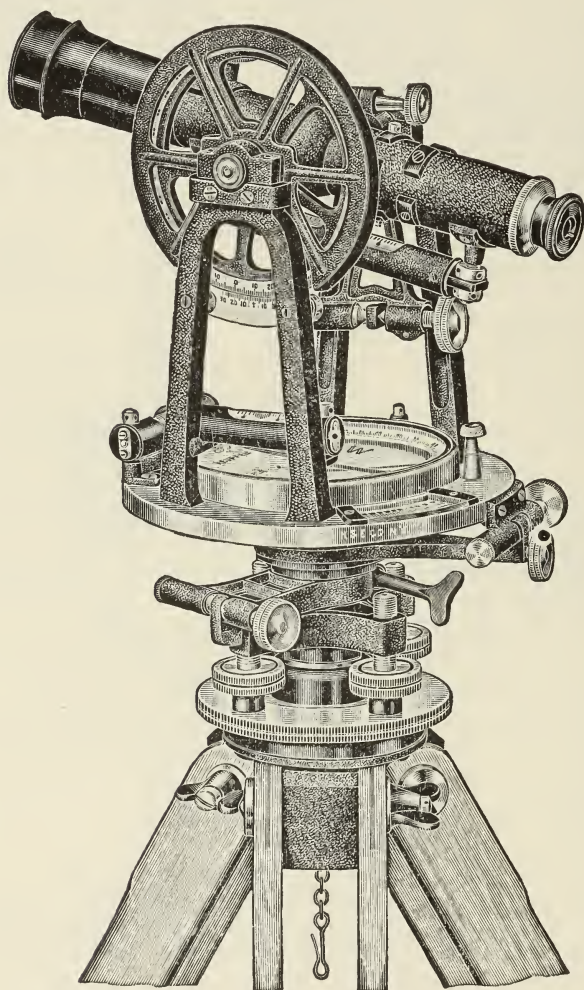
Extension Tripod No. 5180 (page 438) furnished in place of No. 5178 at additional charge each

KEUFFEL & ESSER CO., NEW YORK

Y & S

REG. U. S. PAT. OFF.

SURVEY TRANSITS.



No. Y5166.



Y & S

REG. U. S. PAT. OFF.

SURVEY TRANSITS.

5 INCH HORIZONTAL LIMB.

(For Synopsis of Transits, see page 361)

Y5166. Y & S PRELIMINARY SURVEY TRANSIT with VERTICAL CIRCLE.

Telescope 9 in., achromatic terrestrial, with dust cap. **OBJECT GLASS** $1\frac{1}{8}$ in. (effective aperture 1.06 in.) with improved rack and pinion movement. **EYEPIECE** with spiral adjustment for focusing on cross hairs. **MAGNIFYING POWER** 18 diameters. **STADIA HAIRS** fixed, ratio 1:100. **Fine SPIRIT LEVEL** to telescope, graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation (2 mm). Improved **CLAMP** and **TANGENT SCREW** with counterspring.

Horizontal Limb 5 in. diameter, graduated on special metal to half degrees and numbered like Fig. IV, page 362. Double direct **VERNIER** at about 30° with telescope, reading to one minute. Two fine **SPIRIT LEVELS** graduated on the glass and ground to a sensitiveness of about 100 seconds of arc per graduation (2 mm).

Compass. **NEEDLE** about $3\frac{1}{2}$ in. **COMPASS RING**, graduated to single degrees, can be revolved to set off **VARIATION** of needle.

Vertical Circle, 4 in. diameter, graduated on special metal to half degrees, double direct **VERNIER** reading to one minute. Removable **GUARD** to Circle.

Centers, anti-friction composition, carefully fitted. **FOUR LEVELING SCREWS**. **SHIFTING CENTER**. Improved **CLAMP** and **TANGENT SCREW** with counterspring.

Instrument complete, with strong, light, metal base-plate, trivet points, sunshade, plumb bob, reading glass, adjusting pin and waterproof cover, in hardwood Case and with Tripod No. 5179. each


Weight of transit about $9\frac{1}{2}$ lbs. **Weight** of tripod about 10 lbs.

Y5166S. Y & S PRELIMINARY SURVEY TRANSIT, like No. Y5166, but with **K & E Stadia Circle**, 4 in. diameter, in place of Vertical Circle each

Y5166-2. Y & S SURVEY TRANSIT, like No. Y5166, but with two opposite double-direct verniers to the horizontal limb each

Y5166S-2. Y & S SURVEY TRANSIT, like No. Y5166S, but with two opposite double-direct verniers to the horizontal limb each

Extension Tripod No. 5181 (page 438) furnished in place of Tripod No. 5179 at additional charge each


 KEUFFEL & ESSER CO. NEW YORK

K & E
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ARCHITECTS' LEVELS AND TRANSITS.

The **Levels and Transits** described in the pages which follow are designed to meet the ordinary requirements of the architect, builder and contractor. They are exceptionally well made, accurate and durable, and sell at a moderate price.

GENERAL DESCRIPTION.

No. 5108 is a **Dumpy Level**, i.e. the telescope is permanently secured to the supports of the level bar. It is employed for leveling only. It is simpler to operate than the Y-level; requires less careful handling; and does not get out of adjustment easily. On the other hand, it is somewhat more difficult to adjust than the Y-level.

The **Y-Level** No. 5112T is **not** only useful for leveling, but for reading horizontal angles on level or slightly sloping areas. This instrument is suitable for laying out buildings and running lines; for leveling foundations, walls, floors, curbing, bases for machinery, shafting, etc.; for ditching and draining; and all similar purposes.

The **Convertible Y-Levels** Nos. 5114 and 5114 C, through their special arrangement, can also be used for sighting objects above or below the horizontal, and for plumbing vertical lines. They can be used where the lines or areas under observation have a considerable slope.

No. 5114 C has a **Compass**, by means of which it is possible to set or determine the direction of property lines by magnetic bearings. The compass, in connection with the telescope, makes this instrument more reliable and useful than the ordinary Surveyor's Compass.

The **Contractor's Universal Leveling Instruments** Nos. 5116P and 5116PC are so arranged that they may be used for leveling, plumbing, turning horizontal and vertical angles, and for setting or determining slopes or grades, without shifting the bearings of the telescope. No. 5116PC also has a compass.

No. 5124 is a **Transit**, with which leveling may also be done. The horizontal limb can be read, by vernier, to the nearest minute, so that horizontal angles may be set or determined with a much greater degree of precision than is possible with the Architect's Levels.

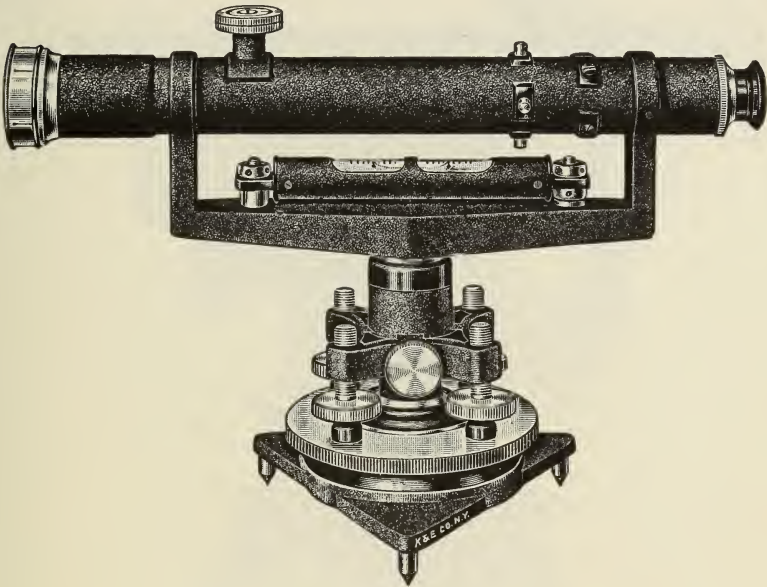
No. 5126 is like No. 5124, except for the addition of a **vertical circle**, by means of which heights and slopes can be determined.

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K & E

REG. U. S. PAT. OFF.

ARCHITECTS' DUMPY LEVEL.



No. 5108.

5108. K & E ARCHITECTS' DUMPY LEVEL.

Telescope 11 in., achromatic terrestrial. **OBJECT GLASS** $1\frac{1}{8}$ in. (effective aperture 1.06 in.), with improved rack and pinion movement. **EYEPIECE** with spiral focusing arrangement. **MAGNIFYING POWER** 18 diameters.

Level Bar of gun metal. **SPIRIT LEVEL** graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation (2 mm). **FOUR LEVELING SCREWS**. **CLAMP SCREW**.

Morocco Finish.

Instrument Complete, with metal trivet, sunshade, adjusting pins and directions, in strong case, and with No. 5174 hardwood Tripod . . each

Weight of instrument, about 5 lbs.

Weight of tripod, about 7 lbs.

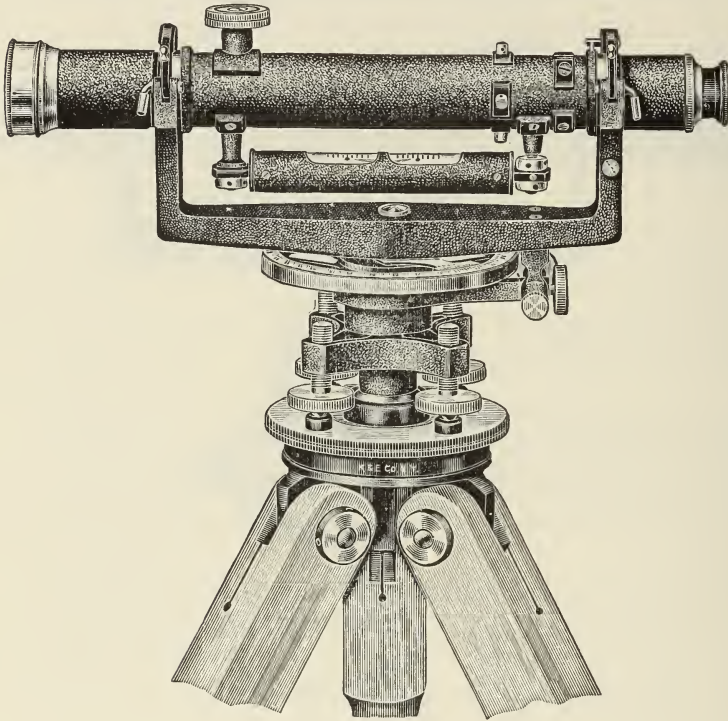
Extension Tripod No. 5181 (page 438) furnished in place of tripod No. 5174 at an additional charge each

KEUFFEL & ESSER CO., NEW YORK

K & E

REG. U. S. PAT. OFF.

ARCHITECTS' Y LEVEL.



No. 5112T.

5112T. K & E ARCHITECTS' Y LEVEL with HORIZONTAL LIMB.

Telescope 11 in., achromatic terrestrial. OBJECT GLASS $1\frac{1}{8}$ in., (effective aperture 1.06 in.) with improved rack and pinion movement. EYEPIECE with spiral focusing arrangement. MAGNIFYING POWER 18 diameters. SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation (2 mm).

Level Bar of gun metal. Y's fitted with improved locking arrangement dispensing with pin bolts.

Horizontal Limb, $3\frac{1}{4}$ in. diameter, graduated to degrees and numbered in quadrants, with VERNIER reading to 5 minutes. Improved CLAMP and TANGENT SCREW with counterspring. FOUR LEVELING SCREWS. SHIFTING CENTER.

Morocco finish.

Instrument complete, with metal trivet, plumb bob, sunshade, adjusting pins and directions, in strong Case and with No. 5174 hardwood Tripod. each

Weight of instrument about $5\frac{3}{4}$ lbs. Weight of tripod about 7 lbs.

Extension tripod No. 5181 (page 438), furnished in place of tripod

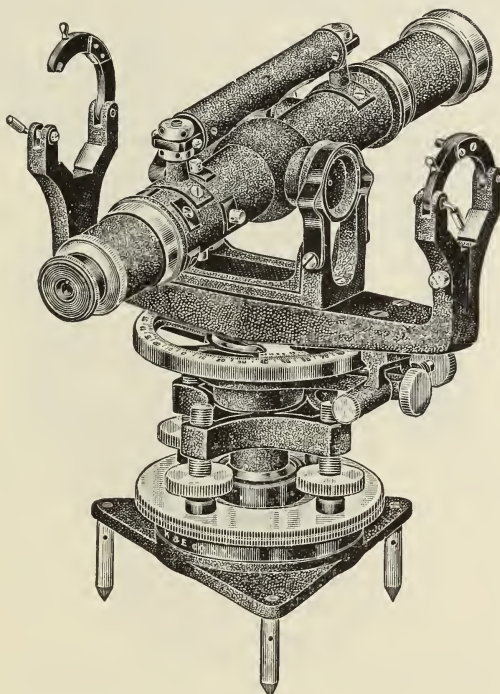
No. 5174 at an additional charge. each



K & E

REG. U. S. PAT. OFF.

ARCHITECTS' CONVERTIBLE Y-LEVEL.



No. 5114 (Sighting a Line).

5114. K & E ARCHITECTS' CONVERTIBLE Y-LEVEL.

Telescope 11 in., achromatic terrestrial. **OBJECT GLASS**, $1\frac{1}{8}$ in., (effective aperture 1.06 in.), with improved rack and pinion movement. **EYEPIECE** with spiral focusing arrangement. **MAGNIFYING POWER** 18 diameters. **SPIRIT LEVEL** to telescope, graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation (2 mm).

Level Bar of gun metal. Y's fitted with improved locking arrangement, dispensing with pin bolts.

Horizontal Limb $3\frac{1}{4}$ in. diameter, graduated in degrees and numbered in quadrants, with **VERNIER** reading to 5 minutes. Improved **CLAMP** and **TANGENT SCREW** with counterspring. **FOUR LEVELING SCREWS**. **SHIFTING CENTER**.

Morocco Finish

Instrument complete, with metal trivet, plumb bob, sunshade, adjusting pins and directions in strong case, and with No. 5174 hardwood Tripod. each

Weight of instrument, about $6\frac{1}{2}$ lbs.

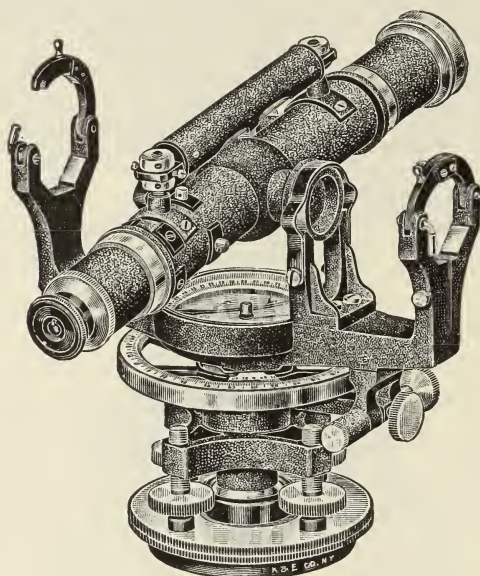
Weight of tripod, about 7 lbs.

Extension Tripod No. 5181 (page 438), furnished in place of tripod No. 5174 at an additional charge each

KEUFFEL & ESSER CO., NEW YORK

K & E
REG. U. S. PAT. OFF.

ARCHITECTS' CONVERTIBLE Y LEVEL. WITH COMPASS.



No. 5114C. (Sighting a Vertical Line).

5114C. K & E ARCHITECTS' CONVERTIBLE Y LEVEL.

Telescope 11 in., achromatic terrestrial, OBJECT GLASS $1\frac{1}{8}$ in. (effective aperture 1.06 in.), with improved rack and pinion movement. **EYEPIECE** with spiral focusing arrangement. **MAGNIFYING POWER** 18 diameters. **SPIRIT LEVEL** to telescope, graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation (2 mm).

Level Bar of gun metal. Y's fitted with improved locking arrangement dispensing with pin bolts.

Compass Needle about 2 in. long. Compass ring raised, graduated to degrees.

Horizontal Limb $3\frac{1}{4}$ in. diam., divided to degrees and numbered in quadrants, with **VERNIER** reading to 5 minutes. Improved **CLAMP** and **TANGENT SCREW** with counterspring. **FOUR LEVELING SCREWS**. **SHIFTING CENTER**.

Morocco finish.

Instrument complete, with metal trivet, plumb bob, sunshade, adjusting pins and directions in strong Case, and with No. 5174 hardwood Tripod. each

Weight of instrument about $6\frac{1}{2}$ lbs. **Weight** of tripod about 7 lbs.

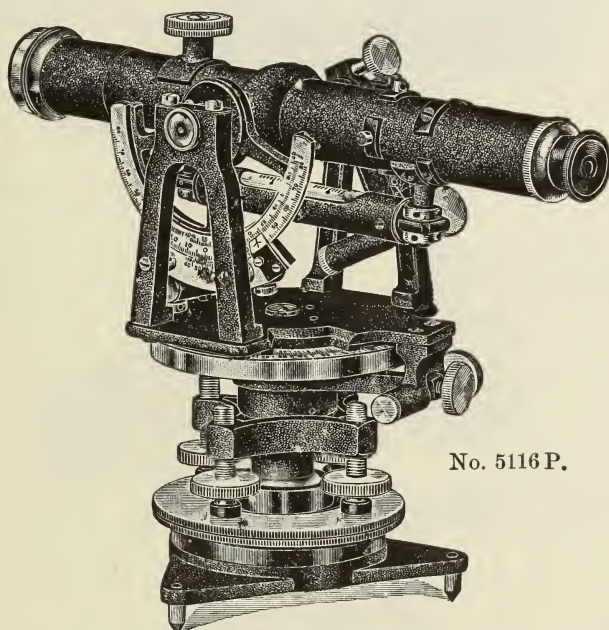
Extension Tripod No. 5181 (page 438), furnished in place of tripod No. 5174, at an additional charge each

KEUFFEL & ESSER CO. NEW YORK

K & E

REG. U. S. PAT. OFF.

CONTRACTORS' UNIVERSAL LEVELING INSTRUMENT.



No. 5116 P.

5116 P. K & E CONTRACTORS' UNIVERSAL LEVELING INSTRUMENT.

Telescope 11 in., achromatic terrestrial. **OBJECT GLASS**, $1\frac{1}{8}$ in., (effective aperture 1.06 in.), with improved rack and pinion movement. **EYEPIECE** with spiral focusing arrangement. **MAGNIFYING POWER** 18 diameters. **SPIRIT LEVEL** to telescope graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation (2 mm).

Horizontal Limb $3\frac{1}{4}$ in. dia., divided to degrees and numbered in quadrants with **VERNIER** reading to 5 minutes. Improved **CLAMP** and **TANGENT SCREW** with counterspring. **SPIRIT LEVEL TO PLATE**. **FOUR LEVELING SCREWS**. **SHIFTING CENTER**.

Vertical Arc, 4 in. dia. divided to degrees and percent of grade. Degree graduations divided to single degrees with **VERNIER** reading to 5 minutes. Percent of grade graduation reading to 2% direct by means of **INDEX** from 0 to 100% for both elevation and depression.

Morocco Finish.

Instrument complete, with metal trivet, plumb bob, sunshade and adjusting pins in strong case, and with No. 5174 hardwood Tripod, each

Weight of instrument, about $6\frac{3}{4}$ lbs. **Weight of tripod**, about 7 lbs.

5116 PC. K & E CONTRACTORS' UNIVERSAL LEVELING INSTRUMENT as described under No. 5116 P, but with addition

of **Compass** having $1\frac{1}{2}$ in. **NEEDLE**. each

Weight of instrument, about 7 lbs.

Extension Tripod No. 5181, (page 438), furnished in place of tripod

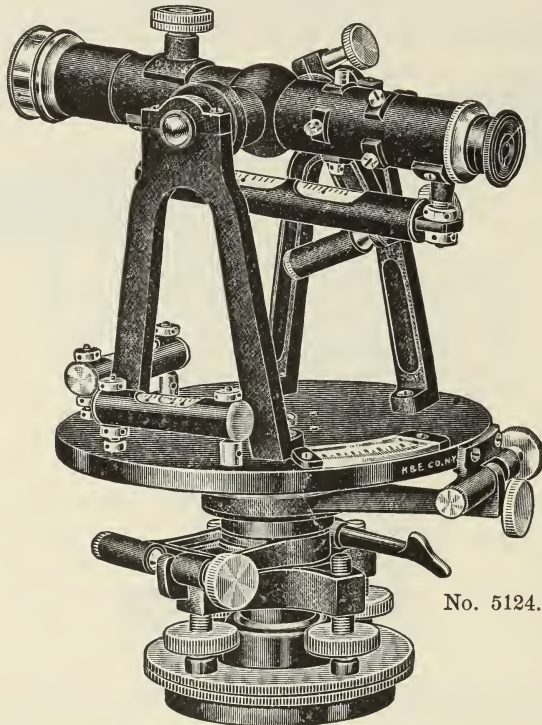
No. 5174 at an additional charge each

KEUFFEL & ESSER CO., NEW YORK

K & E

REG. U. S. PAT. OFF.

BUILDERS' TRANSITS.



No. 5124.

5124. K & E BUILDERS' TRANSIT.

Telescope 8 in., achromatic terrestrial. OBJECT GLASS 1 in. (effective aperture 0.96 in.), with improved rack and pinion movement. EYEPIECE with spiral adjustment, for focusing cross hairs. MAGNIFYING POWER 15 diameters. Fine SPIRIT LEVEL, ground to a sensitiveness of about 60 seconds of arc per graduation (2 mm). CLAMP and TANGENT SCREW with counterspring.

Horizontal Limb 5 in., with vernier reading to single minutes. CLAMP and TANGENT SCREW. Two fine SPIRIT LEVELS ground to a sensitiveness of about 100 seconds of arc per graduation (2 mm).

Centers, anti-friction, carefully fitted. FOUR LEVELING SCREWS. SHIFTING CENTER. CLAMP and TANGENT SCREW with counterspring.

Morocco Finish.

Instrument complete, with plumb bob, reading glass, sunshade and adjusting pins, in hardwood Case, and with No. 5174 Tripod. each

Weight of instrument about $7\frac{1}{2}$ lbs. Weight of tripod about 7 lbs.

*5126. K & E BUILDERS' TRANSIT as described under No. 5124, but with full Vertical Circle $3\frac{1}{2}$ in. diameter, graduated to degrees, reading by VERNIER to five minutes. each

Weight of instrument about $7\frac{3}{4}$ lbs. Weight of tripod about 7 lbs.

Extension Tripod No. 5181 (page 438) furnished in place of tripod No.

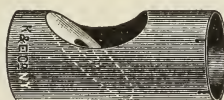
5174, at an additional charge. each

*Made to order only.

KEUFFEL & ESSER CO., NEW YORK

ACCESSORIES FOR TRANSITS LEVELS AND ALIDADES.

When ordering state serial number of instrument for which accessory is required, and, where possible, give the catalogue number also.



No. 5167-1.

5167- 1. Improved Sunshade with Reflector for illuminating cross and stadia hairs.

The reflecting mirror is rigidly mounted on a short tube, placed within the tube forming the sunshade, and held in position by a stop. To use the sunshade without the reflector, the mirror with its separate tube is taken out and the sunshade turned to bring the opening in its side away from the sun.

- | | | |
|-----------|---|------|
| 5167- 2. | Sunshade, plain. | each |
| 5167- 4. | Colored Glass, dark, with Cap to eyepiece | " |
| 5167- 4A. | Eyepiece Cap with self-contained dark color glass | " |
| 5167- 5. | Colored Glass light, with cap (ray filter) | " |
| 5167- 5A. | Eyepiece Cap with self contained light color glass (ray filter) | " |

In Nos. 5167-4A and 5167-5A the color glass serves as a shutter to the opening in the eyepiece cap, and is drawn over the opening when desired.

- | | | |
|-----------|--|---|
| 5167-14A. | Steel Adjusting Pin, large, for wye lock nuts of K & E and Y & S levels | " |
| 5167-14B. | Steel Adjusting Pin, small, for reticule and other small screws and nuts | " |
| 5167-14C. | Steel Adjusting Pin, medium, for wye lock nuts of old style K & E Architect's Levels | " |
| 5167-15. | Phosphor-bronze Adjusting Pin (non-magnetic, for variation plate) | " |
| 5167-16A. | Combination Screwdriver and Center Key | " |
| 5167-16B. | Screwdriver | " |
| 5167-25. | Waterproof Cover for transit or level | " |
| 5167-26. | Leather Case with shoulder strap for transit or level | " |
| 5167-28. | Fine Oil for surveying instruments, in. one oz. bottle | " |
| 5167-29. | Oil Container with dropper | " |
| 5167-76. | Aluminum Base Plate with Trivet points for transit | " |
| 5167-77. | Plumb Bob Cord Adjuster, for regulating the height of the plumb bob point | " |
| 5167-78. | Fine Brush for dusting lenses, glasses and parts | " |



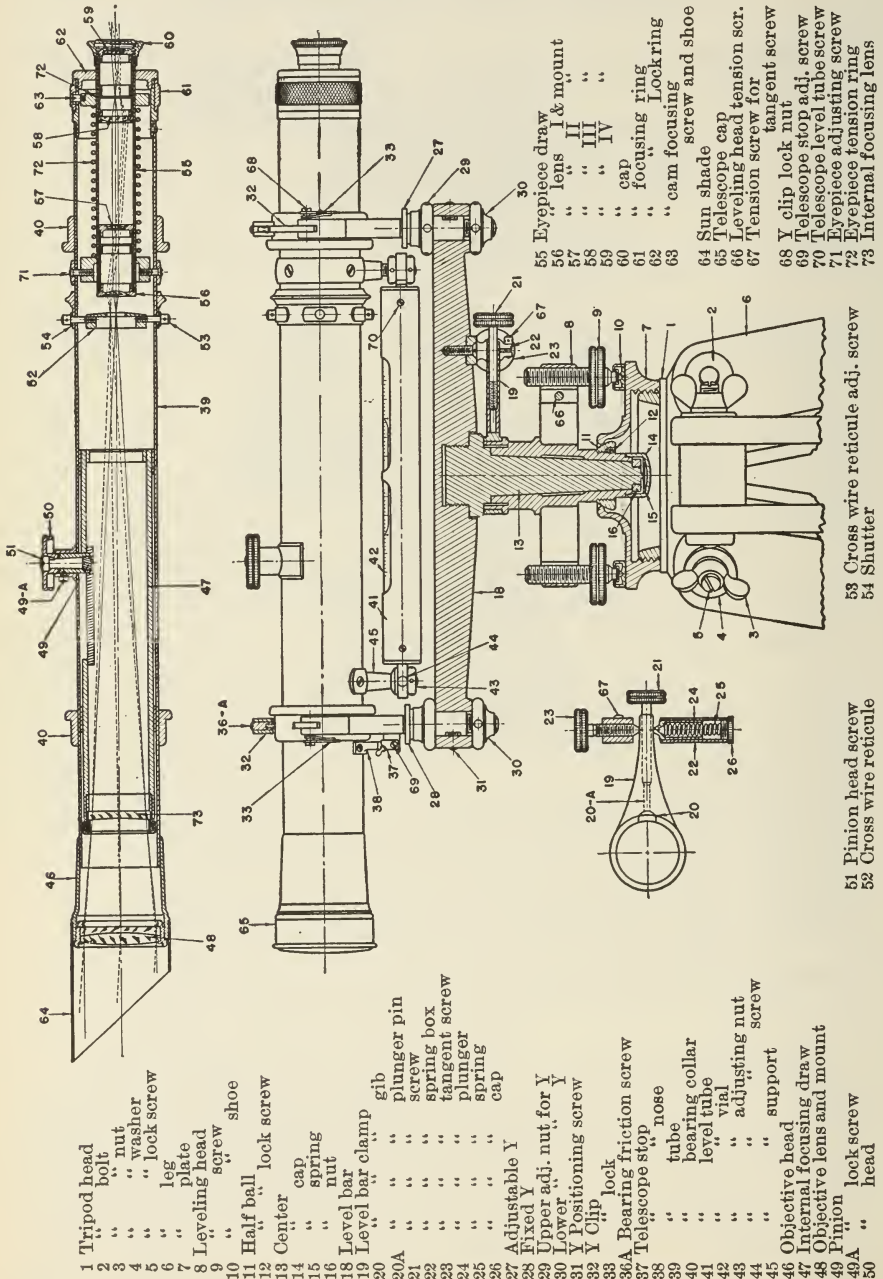
No. 5167-81.

5167-81. Surveyor's Umbrella "

A substantially built umbrella about 5 feet in diameter with 6-ft. slip jointed staff. The staff is provided with one straight and one oblique socket for holding the umbrella in the required position. It is also provided with pointed wrought iron shoe. Metal rings to umbrella ribs, for attaching brace cords.

KEUFFEL & ESSER CO., NEW YORK

COMPONENT PARTS OF WYE LEVELS. TO BE USED IN ORDERING PARTS NOT REGULARLY LISTED.



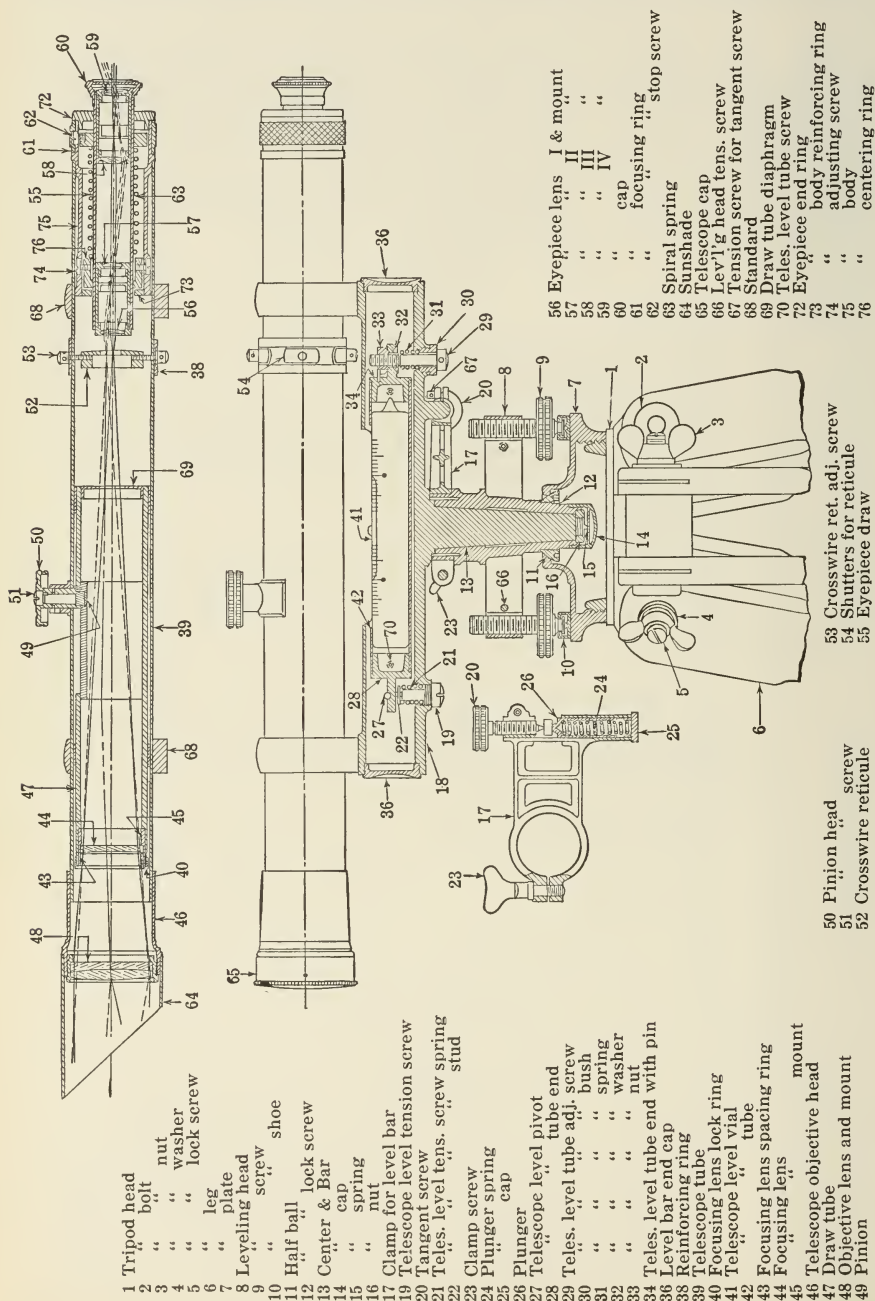
Consult this list when ordering parts for wye levels. Kindly indicate serial number of instrument.
Refer to Catalogue Numbers on page 431, in ordering parts.

REPAIR PARTS FOR WYE LEVELS.

The sub numbers, 7, 9, 10 etc., below, refer to the same numbers on the diagram and list of parts given on page 430. In ordering repair parts always give the serial number of the level, and, if possible, the catalogue number also. The prices given in the Price List are for the parts themselves. If the instrument is sent to the Factory, an additional charge will be made to cover the cost of inserting and adjusting the part. The additional cost will necessarily depend upon the condition of the level when received.

5168- 7.	Tripod Plate	each
9.	Leveling Screw complete	"
10.	Leveling Screw Shoe only	"
14.	Center Cap for Levels Nos. 5005F, 5010F and 5012F	"
14A.	Screw Eye for Plumb Bob Cord, Architects' and Builders' Levels	"
15.	Center Spring for Levels Nos. 5005F, 5010F and 5012F	"
16.	Center Nut	"
21.	Clamp Screw	"
23.	Tangent Screw	"
24.	Plunger, Spring (25), and Cap (26), complete for spring box	"
33.	Y Clip Lock only	"
36A.	Bearing Friction Screw	"
37.	Telescope Stop	"
38.	Telescope Stop Nose	"
41.	Telescope Level with Vial (42) mounted in tube, complete	"
42.	Telescope Level Vial only	"
43.	Telescope Level Adjusting Nut	"
44.	Telescope Level Adjusting Screw	"
48.	Objective Lens in Mount	"
49.	Pinion with Pinion Head (50) and Screw (51), complete	"
49A.	Pinion Lock Screw	"
52A.	Reticule with Plain Cross Hairs	"
52B.	Replacing Cross Hairs on Reticule	"
52C.	Reticule with Fixed Stadia and Cross Hairs	"
52D.	Replacing Stadia and Cross Hairs on Reticule	"
53.	Reticule Adjusting Screws	"
54.	Shutter Plate for Reticule Mount	"
60.	Eyepiece Cap	"
65.	Telescope Cap for Objective	"
68.	Y Clip Lock Nut	"
69.	Telescope Stop Adjusting Screw	"
70.	Telescope Level Tube Screw	"
71.	Eyepiece Adjusting Screw	"

TO BE USED IN ORDERING PARTS NOT REGULARLY LISTED.



**Consult this list when ordering parts for dumpy levels. Kindly indicate serial number of instrument.
Refer to Catalogue Numbers on page 433, in ordering parts.**

REPAIR PARTS FOR DUMPY LEVELS.

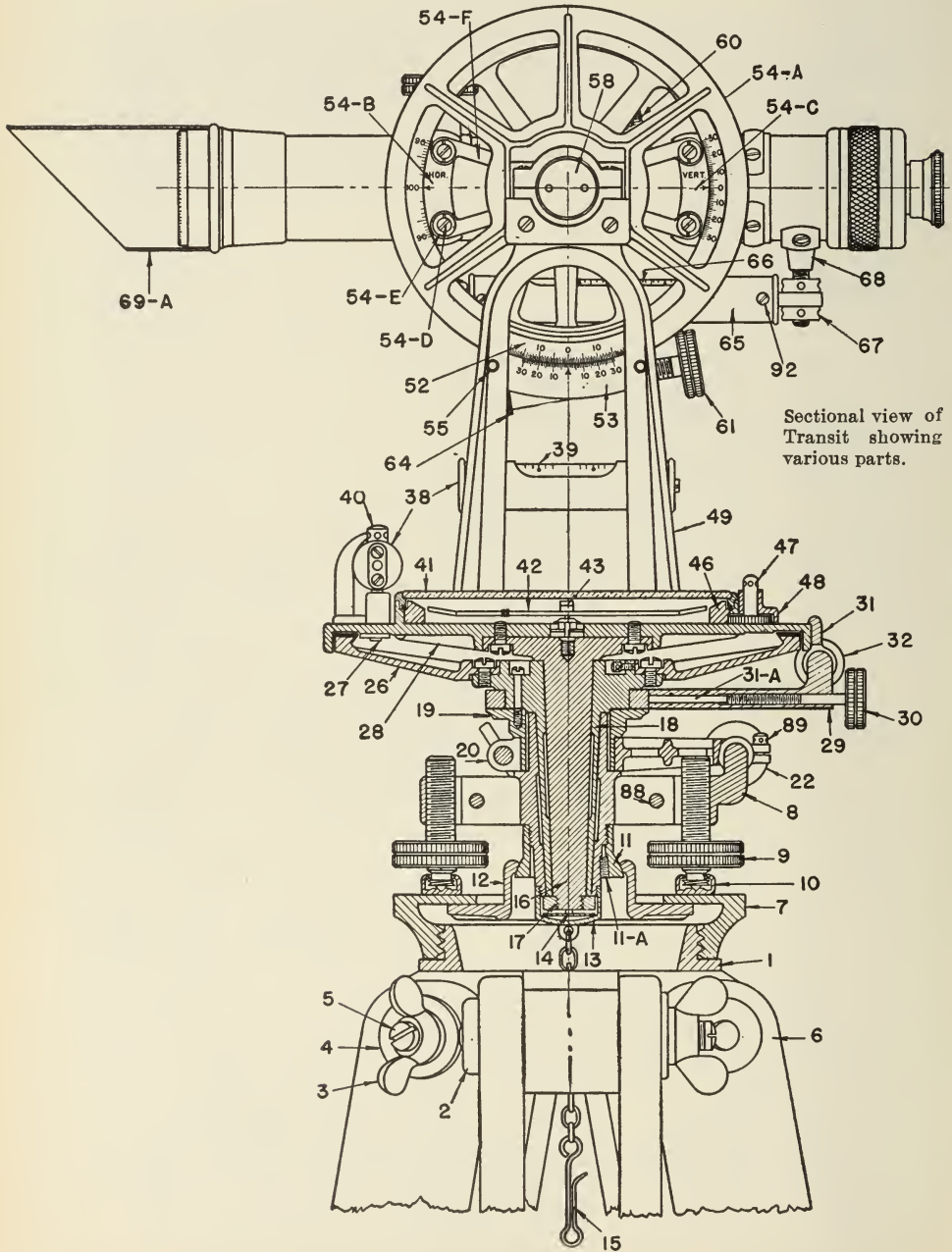
The sub-numbers 7, 9, 10 etc., below refer to the same numbers on the diagram and list of parts given on page 432. In ordering repair parts always give the serial number of the level, and, if possible, the catalogue number also. The prices given in the Price List are for the parts themselves. If the instrument is sent to the Factory, an additional charge will be made to cover the cost of inserting and adjusting the part. The additional cost will necessarily depend upon the condition of the level when received.

5168 $\frac{1}{2}$ -7.	Tripod Plate.....	each
9.	Leveling Screw complete.....	"
10.	Leveling Screw Shoe only	"
14.	Center Cap for No. 5003F.....	"
15.	Center Spring for No. 5003F.....	"
16.	Center Nut for No. 5003F.....	"
20.	Tangent Screw	"
21.	Level Tension Screw Spring for No. 5003F.....	"
22.	Level Tension Screw Spring Stud for No. 5003F.....	"
23.	Clamp Screw	"
24.	Plunger Spring	"
25.	Plunger Cap.....	"
26.	Plunger	"
29.	Telescope Level Adjusting Screw for No. 5003F.....	"
30.	Telescope Level Adjusting Screw Bushing for No. 5003F.....	"
31.	Telescope Level Adjusting Screw Spring for No. 5003F.....	"
32.	Telescope Level Adjusting Screw Washer for No. 5003F.....	"
33.	Telescope Level Adjusting Screw Nut for No. 5003F.....	"
36.	Level Bar End Cap for No. 5003F.....	"
41.	Telescope Level Vial.....	"
48.	Objective Lens in Mount.....	"
49.	Pinion with Head (50) and Screw (51).....	"
52A.	Reticule with Plain Cross Hairs	"
52B.	Replacing Cross Hairs on Reticule	"
52C.	Reticule with Fixed Stadia and Cross Hairs.....	"
52D.	Replacing Stadia and Cross Hairs on Reticule.....	"
53.	Crosswire Reticule Adjusting Screw.....	"
54.	Shutters for Reticule	"
60.	Eyepiece Cap.....	"
66.	Leveling Head Tension Screw.....	"
67.	Tangent Screw Tension Screw.....	"

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COMPONENT PARTS OF TRANSITS.

TO BE USED IN ORDERING PARTS NOT REGULARLY LISTED.

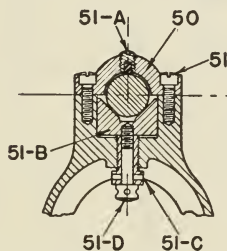
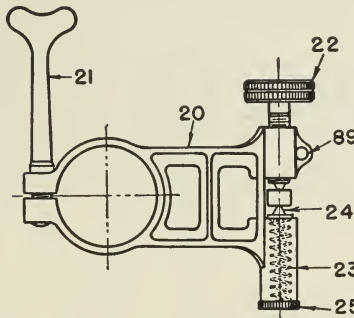


Refer to Catalogue Numbers on page 435, in ordering parts.

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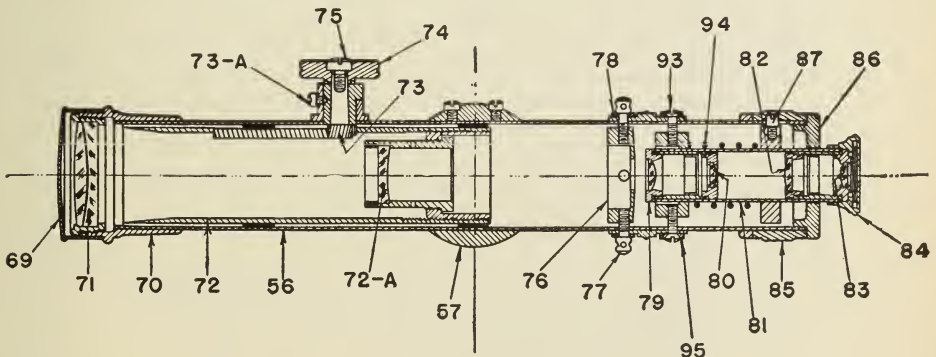
COMPONENT PARTS OF TRANSITS, (Cont'd).

- 1 Tripod head
- 2 " " bolt
- 3 " " nut
- 4 " " washer
- 5 " " lock screw
- 6 " " leg
- 7 " " plate
- 8 Leveling head
- 9 " " screw
- 10 " " shoe
- 11 Half ball
- 11-A " " lock screw
- 12 Shifting plate
- 13 Center cap
- 14 " " spring
- 15 Plumb bob chain & hook
- 16 Inner center
- 17 Center nut
- 18 Outer center
- 19 Clamp collar
- 20 Lower clamp
- 21 " " screw
- 22 " " tang't screw
- 23 " " spring
- 24 " " plunger
- 25 " " cap
- 26 Horizontal limb
- 27 Vernier
- 28 " " plate
- 29 " " clamp
- 30 " " screw
- 31 Vernier plate clamp
- 31-A Vernier plate clamp
- 32 " " spring box
- 32 " " plunger pin
- 32 " " plate clamp
- 32 " " tang't screw
- 33* " " plate clamp
- 33* " " plunger
- 34* " " plate clamp
- 34* " " spring



- 35* Vernier plate clamp cap
- 36* Vernier cover glass
- 37* " " frame
- 37-1* " " reflector
- 37-2* " " hinges

- 38 Vernier plate level
- 39 " " " vial
- 40 " " " ad-
- 41 " " justing screw
- 41 Compass cover glass
- 42 " " needle
- 43 " " cap
- 44* " " lifter
- 45* Compass needle lifter
- 46 " " screw
- 46 " " ring
- 47 " " variat'n pinion
- 48 " " housing
- 49 Standard
- 50 " " cap
- 51 " " screw
- 51-A Axle friction screw
- 51-B " " bearing block
- 51-C " " bearing block
- 51-D " " adjusting screw
- 52 Vertical circle
- 53 " " vernier
- 54-A " " guard
- 54-B Stadia index hor.
- 54-C " " vert.
- 54-D " " lock screw
- 54-E " " adj't.
- 54-F " " frame
- 55 Vernier post and nut
- 56* Telescope tube
- 57* Telescope axle
- 58 " " end cap
- 59* " " clamp
- 60 " " screw
- 61 " " tang't screw
- 62* " " spring
- 63* " " plunger
- 64* " " cap
- 65 " " level



- 66 Telescope level vial
- 67 " " adjust-
- 68 " " ing nut
- 68 " " support
- 69 Telescope cap
- 69-A Sunshade
- 70 Objective head
- 71 " " lens & mount
- 72 Internal focusing draw
- 72-A " " lens
- 73 Pinion
- 73-A " " lock screw
- 74 " " head
- 75 " " screw
- 76 Reticule
- 77 " " adjusting screw
- 78 Shutter for reticule
- 79 Eyepiece lens I and mount
- 80 " " II
- 81 " " draw
- 82 " " lens III
- 83 " " lens IV
- 84 " " cap
- 85 " " focusing ring
- 86 " " lock ring
- 87 " " cam shoe and screw
- 88 Leveling head tension screw

- 89 Lower clamp tension
- 90 " " screw
- 90* Spring box tension
- 91* " " screw
- 91* Telescope clamp screw
- 92 Telescope level tube
- 93 " " screw
- 93 Eyepiece adjusting
- 94 " " screw
- 94 " " tension spring
- 95 Shutter for eyepiece
- 95 " " adjusting screw

* not shown

Consult this list when ordering single parts for transits; kindly indicate serial number of instrument.

Refer to Catalogue Numbers on page 436, in ordering parts.

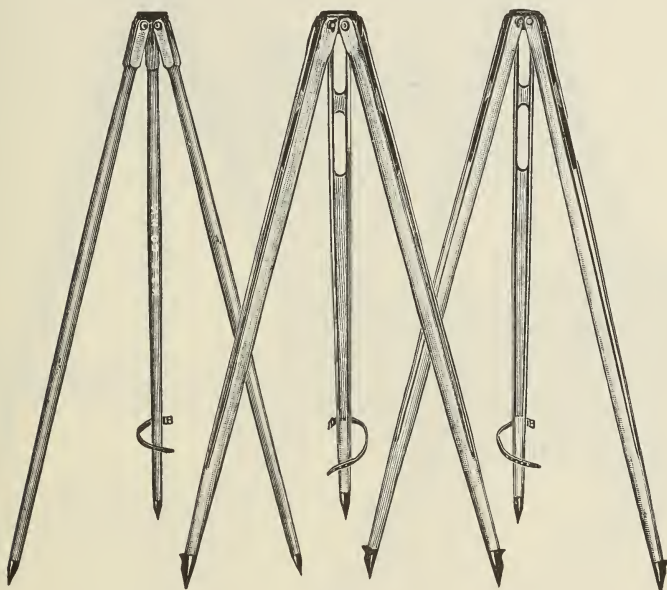
REPAIR PARTS FOR TRANSITS.

The sub numbers, 7, 9, 10 etc., below, refer to the same numbers on the diagrams and list of parts given on pages 434 and 435. In ordering repair parts always give the serial number of the transit, and, if possible, the catalogue number also. The prices given in the Price List are for the parts themselves. If the instrument is sent to the Factory, an additional charge will be made to cover the cost of inserting and adjusting the part. The additional cost will necessarily depend upon the condition of the transit when received.

N 5169-7.	Tripod Plate	each
9.	Leveling Screw complete	"
10.	Leveling Screw Shoe only	"
13.	Center Cap with Plumb Bob Chain and Hook (K & E Engineers' Transits)	"
14.	Center Spring (K & E Engineers' Transits)	"
15.	Chain, Hook and Screw Eye, for Plumb Bob (Y & S Transits). ..	"
17.	Center Nut	"
21.	Lower Clamp Screw	"
22.	Lower Clamp Tangent Screw	"
23.	Lower Clamp Spring with Plunger (24) and Cap (25), complete ..	"
30.	Vernier Plate Clamp Screw with Plunger	"
31.	Vernier Plate Clamp Spring Box with Tangent Screw (32), Plunger (33), Spring (34), and Cap (35), complete	"
32.	Vernier Plate Clamp Tangent Screw only	"
33.	Vernier Plate Clamp Plunger, Spring (34), and Clamp (35), complete	"
36.	Vernier Cover Glass	"
37.	Vernier Cover Frame	"
37-1.	Vernier Reflector	"
37-2.	Vernier Reflector with Hinges	"
38.	Vernier Plate Level with Vial (39) mounted in tube, complete ..	"
39.	Vernier Plate Level Vial only	"
41A.	Compass Cover Glass with ground edges (Y & S Transits) ...	"
41B.	Compass Cover Glass with beveled edge beveled in screw ring (K & E Engineers' Transits)	"
42.	Compass Needle with jeweled cap (43)	"
54A.	Guard for Vertical Circle complete	"
55.	Vertical Circle or Arc Vernier Adjusting Screws	"
58.	Telescope Axle End Cap	"
60.	Telescope Clamp Screw	"
61.	Telescope Clamp Tangent Screw	"
62.	Telescope Clamp Spring, Plunger (63) and Cap (64), complete ..	"
65.	Telescope Level with Vial (66) mounted in tube, complete	"
66.	Telescope Level Vial only	"
67.	Telescope Level Adjusting Nut	"
69.	Telescope Cap for Objective	"
71.	Objective Lens in mount	"
73.	Pinion, Pinion Head (74) and Screw (75) complete	"
76A.	Reticule with Plain Cross Hairs	"
76B.	Replacing Cross Hairs on Reticule	"
76C.	Reticule with Fixed Stadia and Cross Hairs	"
76D.	Replacing Stadia and Cross Hairs on Reticule	"
77.	Reticule Adjusting Screws	"
78.	Shutter Plate for Reticule Mount	"
84.	Eye-piece Cap	"
92.	Telescope Level Tube Screw	"
93.	Eye-piece Adjusting Screw	"

KEUFFEL & ESSER CO., NEW YORK

TRIPODS FOR LEVELS AND TRANSITS.



No. 5174

5178

5179

- 5174. Round Leg Hardwood Tripod**, for Architects' Levels and Transits, and Y & S Dumpy Levels. Weight about 7 lb. Fits same instruments as Nos. 5179 and 5181. each
- 5178. Split Leg Hardwood Tripod**, for Transits and Levels. Weight about 10 to 11 lb. Fits same instruments as 5180. each
- 5178-8. Split Leg Hardwood Tripod** for Transits and Levels having tripod plate with thread $3\frac{1}{2}$ inch dia. and 8 threads per inch ($3\frac{1}{2} \times 8$ threads). Weight about 10 to 11 lbs. Fits same instruments as No. 5180-8. each
- 5179. Split Leg Hardwood Tripod**, similar to No. 5178, for Transits Nos. 5077 F, Y5166 and Y5166 S. Weight about $9\frac{1}{2}$ lb. Fits same instruments as Nos. 5174 and 5181. each
- Tripods Nos. 5178, 5178-8 and 5179 are furnished with spurs, as illustrated.

NOTE: Every K & E tripod is shipped in an individual container, which may be used again whenever it is necessary to re-ship the tripod.

REPAIR PARTS FOR TRIPODS.

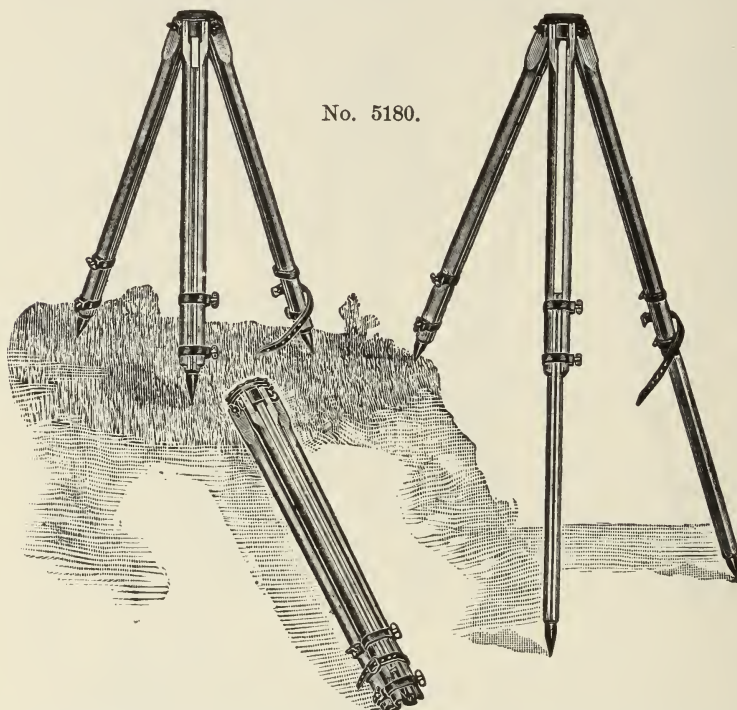
When ordering be sure to specify Catalogue Number of Tripod or the serial number of the instrument which it fits. The sub numbers given below refer to the same numbers on the diagrams and lists of parts given on pages 430 to 435.

- 5172-1. Tripod Head with Bolts, (2), Nuts (3), Washers (4), Lock Screws and Cap complete.** each
2. Bolt with Nut, (3), Washer (4) and Lock Screw. "
6. Hardwood Leg. "
8. Tripod Shoe. "
- C. Aluminum Cap. "
- S. Leather Strap. "
- R. Clamp Ring for Legs of Extension Tripods. "

KEUFFEL & ESSER CO., NEW YORK

EXTENSION TRIPODS.

No. 5180.



This **Extension Tripod** combines rigidity with lightness; its manipulation is easy and its construction such that the sliding leg can neither wear loose nor bind, but will always move smoothly. The special clamps render it as steady as any solid-leg tripod, even when the legs are fully extended. The head is very firm. It is adjustable to any height between 30 and 57 inches.

- 5180. Extension Tripod**, for levels and transits. Weight about 10 to 11 lbs. each
Furnished in place of No. 5178 at an extra charge, each
- 5180-8. Extension Tripod**, for Levels and Transits having a tripod plate with thread $3\frac{1}{2}$ inch dia. and 8 threads per inch ($3\frac{1}{2} \times 8$ threads). Weight about 10 to 11 lbs. each
Furnished in place of No. 5178-8 at an extra charge, each
- 5181. Extension Tripod**, like No. 5180, but lighter, for Architect's and Builder's Transits and Levels, Y & S Dumpy Levels, and Light Engineer's Transits. Weight about 7 to 8 lbs. each
if with instrument in place of 5174 add
if with instrument in place of 5179 "
- 5183. Extension Tripod** for Transit No. 5079F. Weight about 4 lbs. each
Tripods with one extension leg and two split legs, deduct from price of extension tripod

Tripods with one extension leg offer nearly all the advantages of a tripod with three extension legs, when used on uneven ground, but they cannot be put up as compactly for carrying.

NOTE: Every K & E tripod is shipped in an individual container, which may be used again whenever it is necessary to re-ship the tripod.

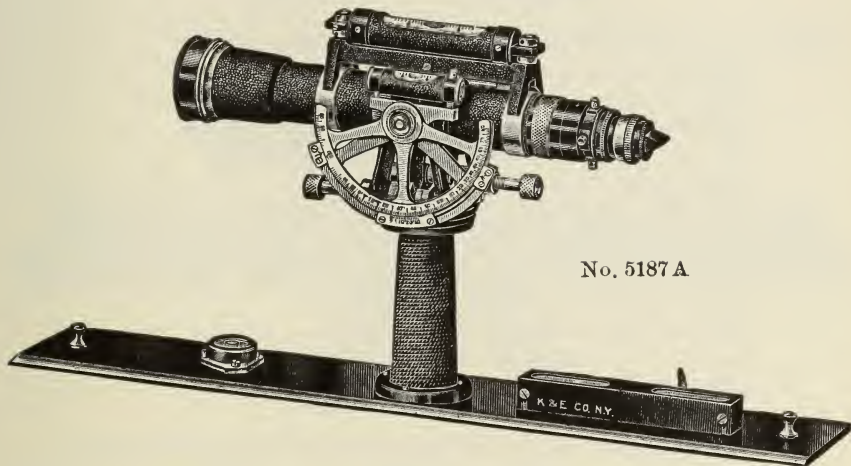
For other Tripods, see preceding page.

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K & E

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PLANE TABLES



No. 5187 A

5187A. K & E GEOLOGICAL SURVEY ALIDADE (as made for the U. S. Geological Survey).

Telescope INTERNAL FOCUSING 10 in. achromatic astronomical (inverting). OBJECT GLASS $1\frac{3}{8}$ in. (effective aperture 1.36 in.). INTERNAL DRAWTUBE, with ring focusing device. EYEPiece, achromatic, with spiral focusing arrangement, designed to give maximum field. MAGNIFYING POWER about 16 diameters. PRISM ATTACHMENT which can be screwed to eyepiece. STADIA HAIRS fixed, ratio 1:100, reading direct from center of instrument (constant $f + c$ being negligible).* To facilitate adjustment of cross-hairs, telescope can be revolved on longitudinal axis and also clamped against such revolution. STRIDING SPIRIT LEVEL to telescope, graduated on the glass and ground to a sensitiveness of about 45 seconds of arc per graduation (2 mm). CLAMP to telescope with TANGENT SCREW. VERNIER CONTROL LEVEL, graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation (2 mm).

Vertical Arc 4 in. diameter, graduated on special metal to half degrees, with zero of vernier at 30° graduation when telescope is level. DOUBLE DIRECT VERNIER reading to one minute. K & E STADIA ARC. TANGENT SCREW for setting Vernier or Stadia Arc indexes.

Alidade Blade, brass, 18×3 in., one edge beveled. CIRCULAR SPIRIT LEVEL with hermetically sealed vial. TROUGH COMPASS with readily detachable cover, GOLD PLATED NEEDLE about 4 in., with stop.

Case, hardwood, with carrying strap and hooks, containing sunshade, eyepiece prism, spare level vials, hand magnifier, and screw driver.

Weight of alidade about $6\frac{1}{2}$ lbs. Height of alidade about $7\frac{1}{4}$ in.

Alidade, complete as described above. each

*Additional $\frac{1}{2}$ interval hair in upper half of field furnished, when ordered with instrument, without extra charge.

Platinum Cross and Stadia wires furnished upon order.

For K & E Stadia Arc, see pages 411 and 414. For Plane Table Paper, see page 444.

For description of Internal Focusing Telescope, see page 365.

For Aluminum Mounted Plane Table Sheets, see page 440.



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PLANE TABLES.

5187B. K & E PLANE TABLE OUTFIT, consisting of :

Alidade No. 5187A, as described on page 439,
Tripod No. 5193, as described on page 443,
Board No. 5197B, 18×24 in., as described on page 443,
Case No. 5198B, for board, as described on page 443,
Outfit complete, as described each

5187C. K & E PLANE TABLE OUTFIT, consisting of :

Alidade No. 5187A, as described on page 439,
Tripod No. 5193, as described on page 443,
Board No. 5197C, 24×31 in., as described on page 443,
Case No. 5198C, for board, as described on page 443,
Outfit complete, as described each

EXTRAS FOR K & E GEOLOGICAL SURVEY ALIDADE,

No. 5187A

(see also pages 412 to 414).

The prices of the following items apply only for parts
ordered with new instruments.

Graduation of Blade to any special scale each
Gradienter “
Adjustable Magnifier “
Extra Glass Vial for striding level “
Extra Glass Vial for control level “

Alumount PLANE TABLE SHEETS.

TRADE MARK

as made for the U. S. Coast & Geodetic Survey and U. S. Geological Survey.

White drawing paper mounted on both sides of an aluminum sheet. The drawing paper employed is of an unusually high quality, and has a smooth surface especially suitable for the finest pen and ink work and for photographic reproduction. The erasing quality is excellent. The sheets will not change in dimension with changes of humidity, and are guaranteed against spotting or other chemical effects of the metal.

The paper is perforated, and the corners and edges of the plate are notched, for the clamp screws of the plane table board to avoid interference with the movement of the alidade blade. The dimensions given are the full size of the sheet.

110 AN-1. *Alumount* Sheet, 18×24 in., aluminum .025 in. thick . . per sheet

110 CN-4. *Alumount* Sheet, 24×31 in., aluminum .04 thick. “ “

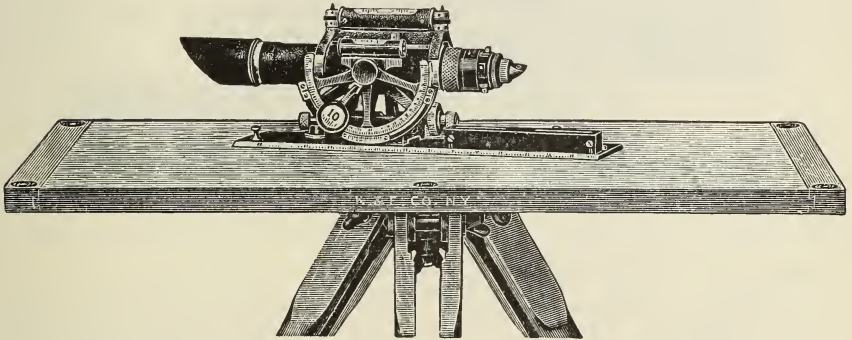
KEUFFEL & ESSER CO., NEW YORK

K & E

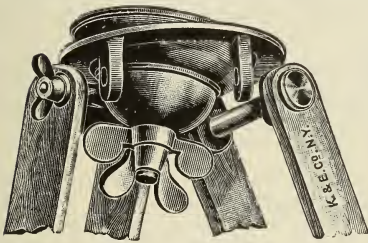
REG. U. S. PAT. OFF.

PLANE TABLES.

Complete Plane Table Outfits listed on page 444.

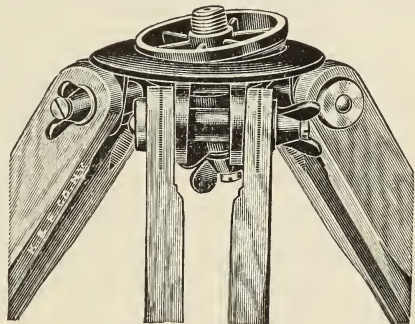


Plane Table Outfit consisting of Alidade No. 5189A, Board No. 5197B and Tripod No. 5195.

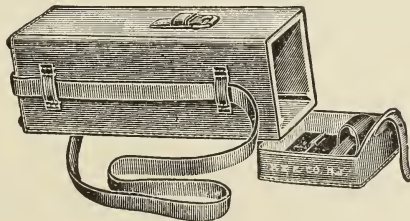


Tripod No. 5193.

(The cut shows one leg of the tripod removed, to afford a better view of the construction)



Tripod No. 5195.



Case for Alidade
No. 5189A.

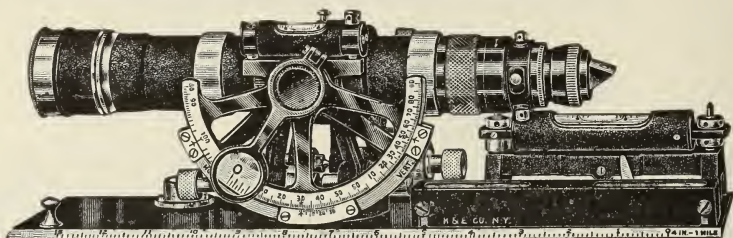
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PLANE TABLES.

Complete Plane Table Outfits listed on page 444.



No. 5189A

5189A. K & E EXPEDITION ALIDADE.

Telescope INTERNAL FOCUSING $9\frac{1}{2}$ in., achromatic astronomical (inverting)*. OBJECT GLASS $1\frac{3}{8}$ in. (effective aperture 1.14 in.). INTERNAL DRAWTUBE, with ring focusing device. EYEPiece, prismatic, achromatic, with spiral focusing arrangement, designed to give maximum field. MAGNIFYING POWER about 14 diameters. STADIA HAIRS fixed, ratio 1:100 reading direct from center of instrument (constant $f+c$ being negligible).† To facilitate adjustment of cross-hairs, telescope can be revolved on longitudinal axis and also clamped against such revolution. STRIDING SPIRIT LEVEL (with finder sights) to telescope, graduated on the glass and ground to a sensitiveness of about 45 seconds of arc per graduation (2 mm). CLAMP to telescope with GRADIENTER SCREW. VERNIER CONTROL LEVEL, graduated on the glass and ground to a sensitiveness of about 60 seconds of arc per graduation (2 mm).

Vertical Arc, 4 in. diameter, graduated on special metal to half degrees, with zero of vernier at 30° graduation when telescope is level. DOUBLE DIRECT VERNIER reading to one minute. Reads angles of elevation to 25 degrees, and of depression to 20 degrees. K & E STADIA ARC. TANGENT SCREW for setting Vernier or Stadia Arc indexes. ATTACHED ADJUSTABLE MAGNIFIER.

Alidade Blade, brass, $11\frac{1}{2} \times 3\frac{1}{4}$ in., both edges beveled. One edge graduated 50 parts to the inch, one edge 4 inches to the mile. CIRCULAR SPIRIT LEVEL with hermetically sealed vial. TROUGH COMPASS, with readily detachable cover; NEEDLE about 4 in. with stop.

Case, leather covered, with shoulder strap, containing sunshade, and adjusting pin. Case about $12\frac{5}{8} \times 4\frac{1}{4} \times 4\frac{1}{2}$ in. overall. (See illustration page 441). The alidade fits in the case with the sunshade in place on the telescope.

Weight of alidade only, about $4\frac{1}{2}$ lbs. Weight of alidade and case, about $7\frac{3}{4}$ lbs. Height of alidade, about $3\frac{1}{2}$ in.

Alidade complete as described above each

*The telescope is actually inverting, but the prism eyepiece, being permanently attached, gives an erect but reversed image.

†Additional $\frac{1}{2}$ interval hair in upper half of field furnished, when ordered with instrument, without extra charge.

Platinum stadia and cross wires furnished, when ordered with instrument, without extra charge.

For K & E Stadia Arc, see pages 411 and 414.

For Plane Table Paper, see page 444.

For Aluminum Mounted Plane Table Sheets, see page 440.



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PLANE TABLES.

For Complete Outfits see page 444.

EXTRAS FOR EXPEDITION PLANE TABLE ALIDADES.

(see also pages 412 to 414.)

Prices given are those for items ordered with new instruments.

Extra Eyepiece giving magnification of 10 diameters each
 " " " " " 18 " "
 Graduation of Blade to any special scale "

TRIPODS.

5193. Plane Table Tripod, hardwood, split, with Leveling Arrangement after Johnson, very substantial and rigid (see illustration, page 441). Weight about 11 $\frac{3}{4}$ lbs. each
5195. Plane Table Tripod, with extension legs, light weight, with Leveling Arrangement after Johnson (see illustration, page 441). Weight about 9 lbs. each

The Leveling arrangement (after Johnson), very simple and efficient, consists of two spherical segments movable within one another and two wing nuts, one to keep the segments in apposition, the other to clamp them.

DRAWING BOARDS.

- 5197 A. Plane Table Drawing Board, 15×15 in., white pine, thoroughly seasoned, hardwood end cleats, with brass screw plate to fit heads of tripods Nos. 5193 and 5195. Four clamp screws to hold paper (see illustration page 441). each
- 5197 B. Plane Table Drawing Board, like No. 5197 A, but 18×24 in., with 8 clamp screws to hold paper (see illustration, page 441). each
- 5197 C. Plane Table Drawing Board, like No. 5197 A, but 24×31 in., with 8 clamp screws to hold paper, (see illustration, page 441). each

DRAWING BOARD CASES.

- 5198 A. Plane Table Drawing Board Case, for board No. 5197 A, flexible, canvas, with shoulder strap each
- 5198 B. Plane Table Drawing Board Case, like No. 5198 A, but for board No. 5197 B each
- 5198 C. Plane Table Drawing Board Case, like No. 5198 A, but for board No. 5197 C each

For Plane Table Paper see page 444.

For Aluminum Mounted Plane Table Sheets, see page 440.

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PLANE TABLES.

For Alidades, Tripods, Boards and Cases, see pages 441 to 443.

COMPLETE EXPEDITION PLANE TABLE OUTFITS.

The items marked × on the same vertical line in the Table below form a complete outfit of Alidade, Drawing Board and Case, and Tripod

	COMPLETE OUTFITS			
	5189	5189	5189	5189
	E	G	H	K
	CONSISTING OF			
ALIDADE 5189A	×	×	×	×
TRIPOD 5193			×	×
5195	×	×		
DRAWING BOARD 5197A 15 x 15 in.	×			
5197B 18 x 24 in.		×	×	
5197C 24 x 31 in.				×
CASE FOR BOARD 5198A 15 x 15 in.	×			
5198B 18 x 24 in.		×	×	
5198C 24 x 31 in.				×
OUTFIT COMPLETE				

PLANE TABLE PAPER.

140-2. Duplex* cream colored, mounted on both sides of the muslin.
No. 140-2 is old No. 103.

N122-2. Paragon* white, water-resisting surface, mounted on both sides of the muslin.
No. N122-2 is old No. 139.

N122-3. Paragon double mounted—same paper as No. N122-2, but mounted on both sides of muslin with grain of two sheets at right angles.
No. N122-3 is old No. 139½.

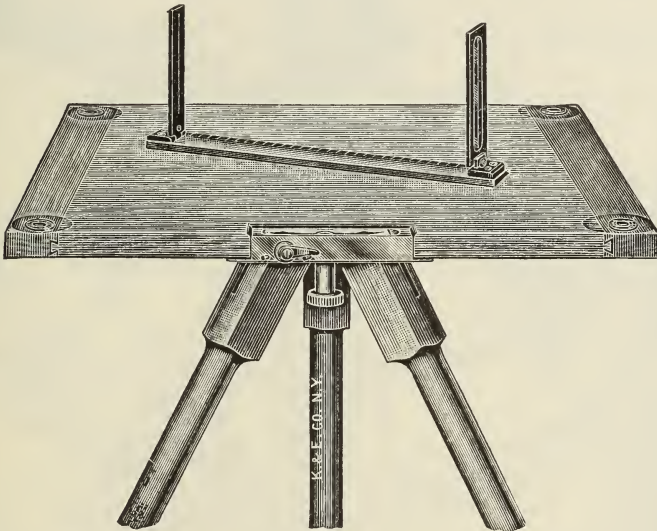
15×15 in. per sheet	140-2	N 122-2	N 122-3
18×24 in. “			
24×31 in. “			

For other mounted papers, see pages 19 to 23.
For drawing paper in sheets, see pages 6 to 17.



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TRAVERSE TABLES.



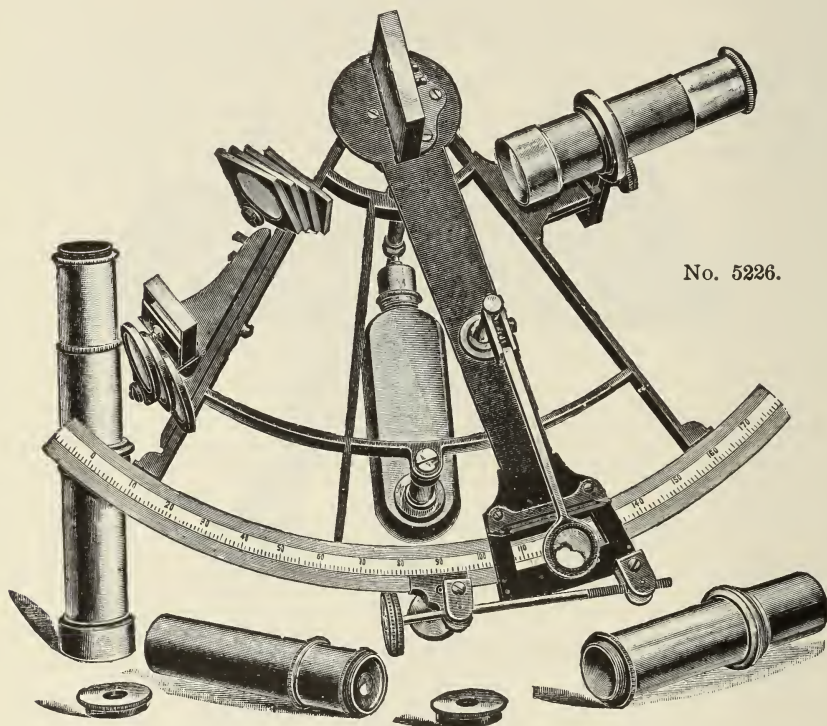
Traverse Table Outfit No. 5200
consisting of
Alidade No. 5200 A
Board No. 5200 B
Tripod No. 5200 T

- 5200A. Traverse Table Alidade**, BRASS, $10\frac{1}{4}$ in., one edge beveled and graduated 40 parts to the inch. FOLDING SIGHTS. In sewed leather SHEATH each
- Graduation of blade to any special scale, extra “
- 5200B. Traverse Table Drawing Board**, best quality pine, 15×15 in., with socket for improved metal swiveling attachment. FINE TROUGH COMPASS set flush with board, NEEDLE about 3 in., jeweled center, with stop. Four clamp screws to hold paper “
- 5200T. Traverse Table Tripod**, similar to No. 5174 (see page 437), with clamp screw “
- 5200X. Traverse Table Extension Tripod**, hardwood, similar to No. 5181 (see page 438) “
- 5200. Traverse Table Outfit**, consisting of Alidade No. 5200A, Board No. 5200B, and Tripod No. 5200T complete
- 5201. Traverse Table Outfit**, consisting of Alidade No. 5200A, Board No. 5200B, and Tripod No. 5200X “

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K & E SEXTANTS.

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No. 5226.

- 5226.** Sextant, high-grade, gun metal, measuring angles up to 145 degrees. Radius 6 in. Graduated on *solid silver* to 10 minutes, vernier reading to 10 seconds; mounted reading lens, Clamp and Tangent Screw to vernier. 1 sighting tube, 1 star telescope, 1 inverting telescope with two eyepieces, magnifying powers 6 and 12 diam.; 7 neutral glasses to sextant, 2 neutral glasses for telescopes. adjustable telescope holder.

Instrument complete, with adjusting key and two screw-drivers, in fine polished mahogany Case with Lock. . . each

- 5227.** Sextant, Surveying, of gun metal, as made by us for the U. S. Navy; measuring angles up to 145 degrees. Radius 6 in. Graduated on *solid silver* to 20 minutes, vernier reading to 30 seconds; mounted reading lens, Clamp and Tangent Screw to vernier. 1 sighting tube, 1 star telescope, 1 inverting telescope, magnifying power 6 diam., 7 neutral glasses to sextant, 2 neutral glasses for telescope, adjustable telescope holder.

Instrument complete, with adjusting key and two screw-drivers, in polished mahogany Case with Lock. . . . each

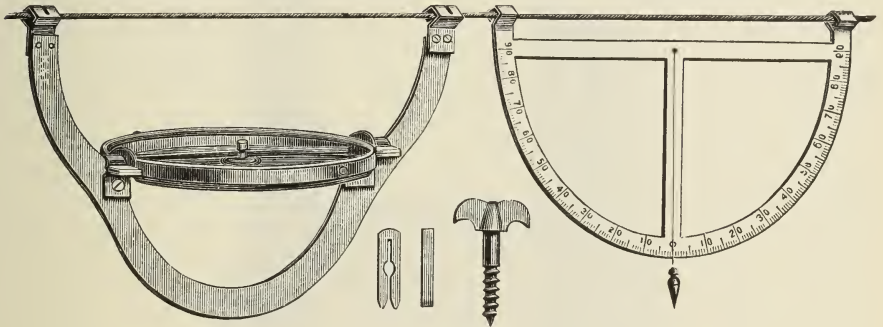
- 5228.** Sextant, Darad,* for use in Aerial and Marine Navigation, WITH ARTIFICIAL HORIZON established by means of special sensitive level each



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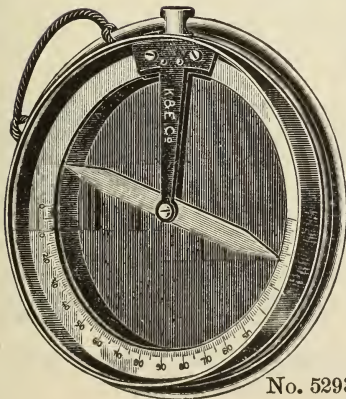
HAND SURVEYING INSTRUMENTS MINING COMPASS AND CLINOMETER.



No. 5280.

- 5280. Mining Compass and Clinometer,** Compass graduated to 1° and numbered in quadrants, suspended in a frame with hooks by a universal joint (gimbal), needle about 3 in., with stop. Clinometer, aluminum, 8 in. diameter, graduated to half degrees, with hooks and plumb bob, screws for cord, brass stop; in chamois-lined leather Sling Case each

MINER'S COMPASS OR DIPPING NEEDLE.



No. 5293

- 5293. Miner's Compass or Dipping Needle,** $3\frac{3}{4}$ in., needle about 3 in., with stop, compass ring graduated on both faces, with inner cover of glass and outer cover of brass for each side. Hence, the instrument may be read from either face. Handle to admit of the free suspension of the case; with Directions each

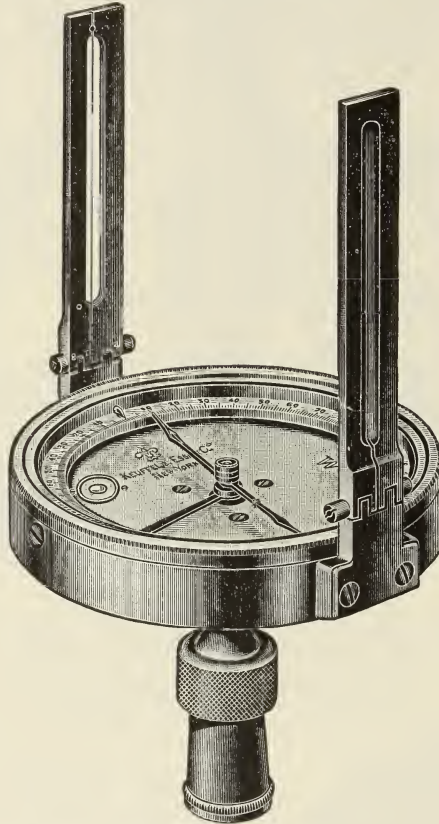


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SURVEYING COMPASSES.

In Surveying and Sighting Compasses of all descriptions the **EAST** and **WEST** lettering is **REVERSED** from its position on the map. This is because the needle is the fixed point while the compass box is revolved in directing the sights to the object observed. For instance, in sighting a point situated N. W. the needle will point N. E., but it will correctly **READ** N. W. in accordance with the line actually sighted, because the East quadrant is marked West.



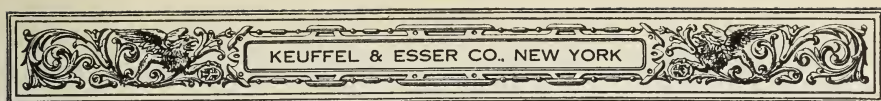
No. 5330.

5330. Surveying and Timber Cruiser's Compass, with folding sights, graduated on raised ring to degrees, numbered in quadrants. **VARIATION** set by pinion with slotted head. **CIRCULAR SPIRIT LEVEL**, hermetically sealed. **COMPASS GLASS** bezeled into screw ring. **NEEDLE** about 3 in., gold-plated. Complete with ball joint and socket (No. 5348-2, page 451) for mounting on Jacob Staff or Tripod; in plain leather pouch each

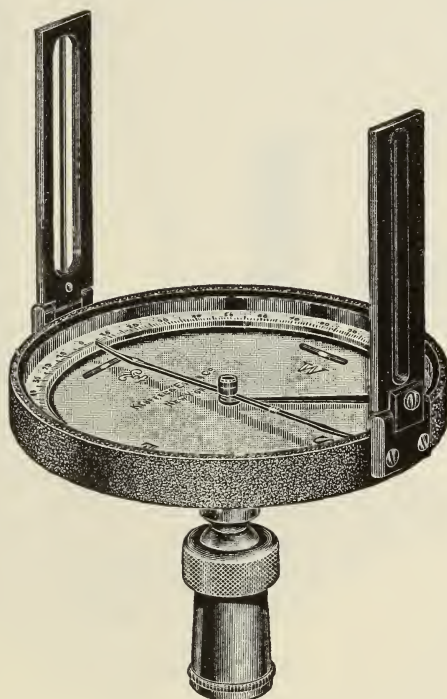
The compass glass is bezeled into a ring which screws on the compass box. This, coupled with the fact that the governing devices for the needle stop and variation setting are designed and arranged so as to render the compass box tight, **makes the entrance of moisture practically impossible.**

No. 5330 fits on Jacob Staff No. 5350 and Tripods Nos. 5352, 5359 and 5360.

For sewed leather Sling Case in place of plain leather pouch
for compass 5330, add



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SURVEYING COMPASSES.



No. 5334.

5332. Surveying Compass, with folding sights, graduated on raised ring to degrees, numbered in quadrants. **VARIATION** set by pinion with capstan head. **2 SPIRIT LEVELS**. **NEEDLE** about 3 in. Complete with ball joint and socket (No. 5348-2, page 451) for mounting on Tripod or Jacob Staff, in leatheret finish Case. each

5334. Surveying Compass like No. 5332 but needle about 4 in. Complete with ball joint and socket (No. 5348-3, page 451); in leatheret finish Case each

Nos. 5332 to 5334 fit on Jacob staff No. 5350 and tripods Nos. 5352 and 5360.

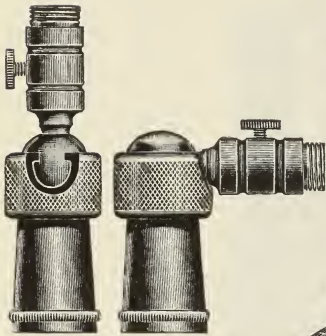
For sewed leather Sling Case in place of leatheret finish case for
compass 5332 add
" 5334 "

Sewed leather Sling Case for compass 5332 each
" " " " " " 5334 "

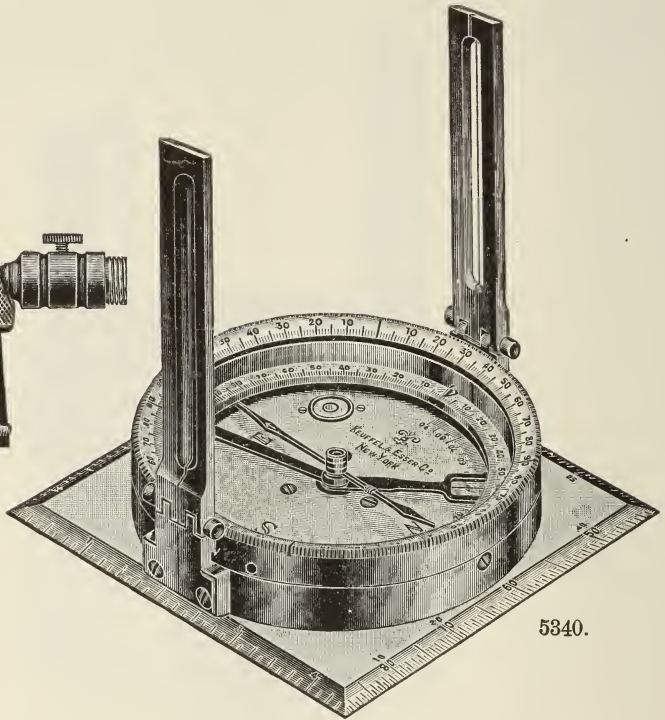
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SURVEYING COMPASS.

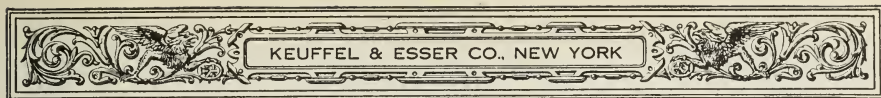
No. 5348-2F.



5340.

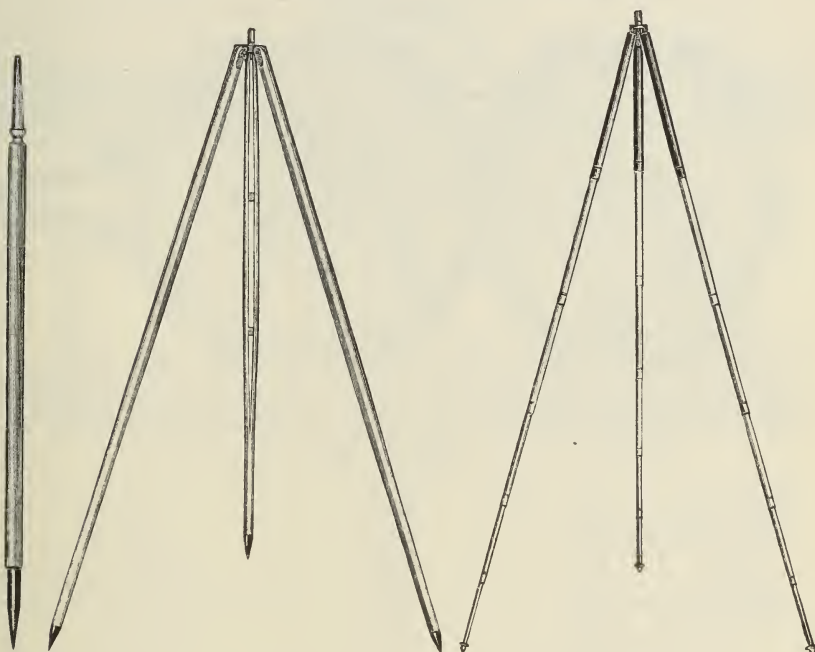
The Forester's and Geologist's Compass is used largely in topographical work. Under the designation **Forester's Compass**, it is made by us for the **U. S. Forest Service**. It is light and portable. The variation of the needle is set off by revolving the raised compass ring by means of a slotted screw projecting through the side of the compass box. The beveled ring can be used for turning right angles or for sighting vertical angles by placing the edge of the base on a level surface. The compass glass is beveled into a ring which screws on the compass box; and the governing devices for the needle stop and variation setting are designed and arranged so as to render the compass box tight. Consequently, the entrance of moisture into the compass box is practically impossible.

5340. Forester's and Geologist's Compass, aluminum, folding brass sights. Raised compass ring graduated to degrees, **VARIATION** set by pinion with slotted head. Improved **GOLD PLATED NEEDLE** about 3 inches, with stop, jeweled center. Beveled ring on compass box, graduated to degrees and numbered in quadrants, with sighting mark at each quadrant, and knurled edge for revolving in azimuth. **PENDULUM CLINOMETER** graduated to degrees for 90 degrees in each direction. Base $4\frac{1}{2} \times 4\frac{1}{2}$ in., beveled edges; two edges graduated as a **PROTRACTOR**, one edge graduated to inches and eighths, representing chains on scale of 1 inch to 1 mile, the other edge graduated to inches and tenths. Hermetically sealed **CIRCULAR SPIRIT LEVEL** inside the compass box. **COMPASS GLASS** beveled into screw ring. Instrument complete with ball joint and socket (No. 5348-2F, page 451) for mounting on Jacob Staff No. 5350 and tripods Nos. 5352, 5359 and 5360; in sewed leather Case with shoulder strap. each



TRIPODS AND JACOB STAFF.

FOR SURVEYING COMPASSES AND HAND INSTRUMENTS.



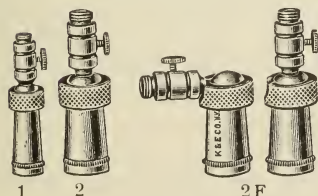
No. 5350.

5352.

5360.

- 5350. Jacob Staff**, 54 in., hardwood, forged steel shoe. Weight about 2 lbs., each
- 5352. Tripod**, split, with brass staff head for light compasses, hand levels, etc. Weight about $3\frac{3}{4}$ lbs. each
- 5359. Telescoping Metal Tripod**, black enamel finish, brass spindle to fit sockets of ball joints Nos. 5348-2 to 5348-5, for hand instruments. Length closed $15\frac{1}{2}$ in.; extended, about 50 in. Weight about $1\frac{3}{4}$ lbs. . . each
- 5360. Telescoping Metal Tripod**, brass, black enamel finish, head and points nickel-plated, brass Jacob staff head, for compasses, clinometers, hand levels, etc. Length closed $16\frac{1}{2}$ in.; extended 60 in. Weight about $2\frac{3}{4}$ lbs. each

BALL JOINTS AND SOCKETS.



5348.

each

-1

-2

-2F

-3

-5

No. 5348-1 fits Jacob staff No. 5350. If used with any of the other joints the Jacob staff must be cut to fit.

All joints except No. 1 fit tripods Nos. 5352, 5359 and 5360. A special spindle to fit joint No. 1 is required by these tripods. This special spindle furnished in place of regular one without extra charge.

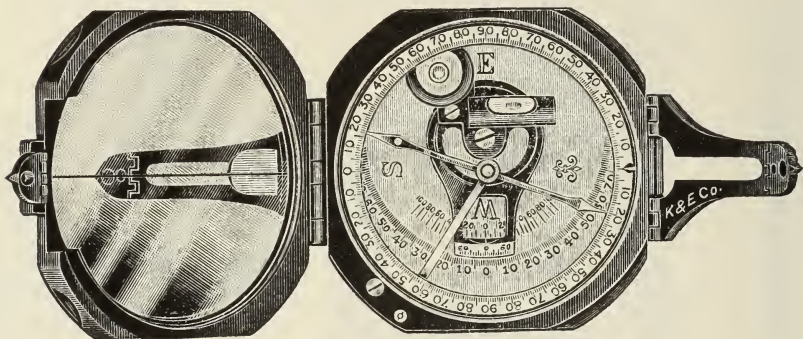
For larger illustrations of ball joints and sockets, see 5348-1, page 463, 5348-2, page 448, 5348-2F, page 450 and 5348-3, page 449.

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POCKET TRANSITS (after BRUNTON).



No. 5368-1.

- 5368-1. Pocket Transit** (after Brunton), aluminum. Cover with fine mirror and center line, hinged brass peep sight and sighting point. Raised compass ring graduated to degrees, **numbered in quadrants**. **VARIATION** set by pinion with slotted head. Improved **NEEDLE** about $2\frac{1}{2}$ in. with jeweled center and automatic stop. **Zero** of compass ring, and **N.** and **S.** points of needle luminous. **CLINOMETER ARC** graduated to degrees, reading by vernier on clinometer arm to 5 minutes. Also arc giving **percent of grade**, up to 100 percent for both elevation and depression; reading by 5 percent up to 60 percent and by 10 percent from 60 to 100 percent. Two sensitive **SPIRIT LEVELS** — one circular for levelling instrument in horizontal plane — one to clinometer arm. Compass Box, made of aluminum with black hardened surface measures $2\frac{3}{4} \times 2\frac{3}{4} \times 1$ in. and weighs about 8 oz. With Directions each
- 5368-2. Pocket Transit** (after Brunton), like No. 5368-1, but compass ring numbered 0 to 360° each
- 5368B. Belt Loop Case** for No. 5368-1 or 5368-2. “
- 5368S. Leather Sling Case** for No. 5368-1 or 5368-2 “
- 5368J. Special Ball Joint** and socket for mounting pocket transit No. 5368-1 or 5368-2 on tripods Nos. 5352, 5359 and 5360 each



The Pocket Transit (after Brunton) combines the principal features of a sighting compass, prismatic compass, hand level and clinometer. It is an accurate and convenient instrument for topographic and preliminary surveys of all kinds. The variation is set off by revolving the raised compass ring by means of a slotted head pinion projecting through a corner of the compass box.

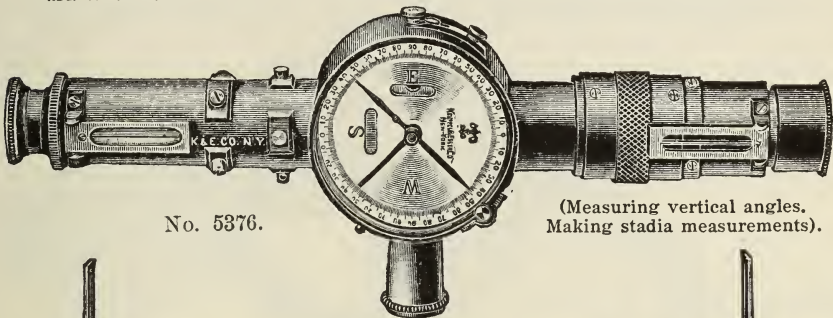
No. 5368 J. fits Jacob staff No. 5350 and tripods Nos. 5352, 5359 and 5360.

Note: In ordering, state number of staff or tripod with which this joint is to be used.

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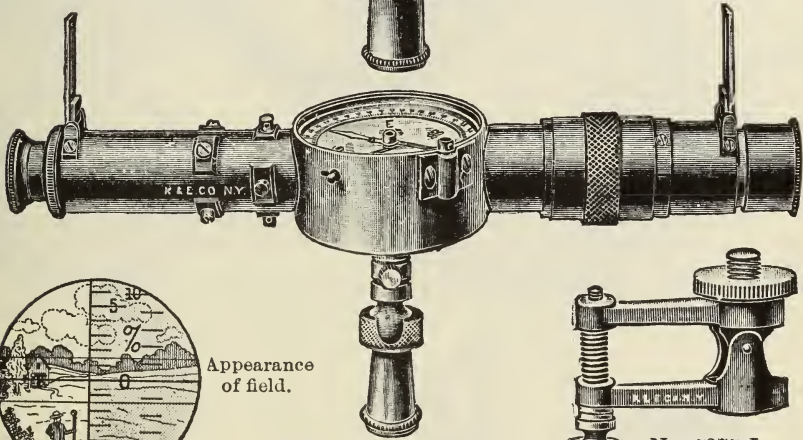
K & E STADIA HAND TRANSITS.

REG. U. S. PAT. OFF.



No. 5376.

(Measuring vertical angles.
Making stadia measurements).



Appearance
of field.

(Taking Compass bearing).
No. 5376

No. 5375. L

- 5376.** Stadia Hand Transit, achromatic terrestrial telescope, 10 in., object glass 1 in., magnifying power about 12 diam., with cross hairs, and fixed stadia hairs ratio 1:100, folding sights. Improved spiral focusing arrangement. Clinometer and Allimeter formed by accurately balanced sensitive weighted ring with automatic stop, gives vertical angles to single degrees, up to 45° both ways, and slopes in feet per 100 feet horizontal, or centimeters per meter. Compass 2½ in., graduated on silvered raised ring to single degrees, variation plate set by capstan-head pinion, improved needle with jeweled center, 2 spirit levels. Folding ball joint and socket, No. 5348-2 F. Adjusting pin of phosphor bronze (which will not disturb the needle) for setting variation plate; in strapped, leather-covered (morocco finish) velvet-lined Case; Weight of instrument with case about 2½ lbs., each
- 5376S.** Stadia Hand Transit, like No. 5376 but in velvet-lined sewed leather Case with shoulder strap. each
- 5375L.** Micrometer Leveling Attachment “

The Improved Stadia Hand Transit is an ideal instrument for Preliminary Surveying, since it is strongly made, compact and light. It is used for measuring: Vertical Angles, Horizontal Angles (Compass Surveys), Grades and Slopes (in per cent, or degrees), and Distances.

Results are obtained with greater accuracy and in less time than with any similar portable instrument. For the Engineer, Road Builder or Surveyor who wants results quickly and with a fair degree of accuracy, the Stadia Hand Transit fills every requirement.

In measuring vertical angles, the sighted object and the two scale readings (slopes and degrees) appear together in the field of view (see cut). Compass bearings can be sighted by the telescope on level ground or by the folding sights on sloping ground.

The Leveling Attachment adds considerably to the accuracy of the Stadia Hand Transit, especially when sighting at long range.

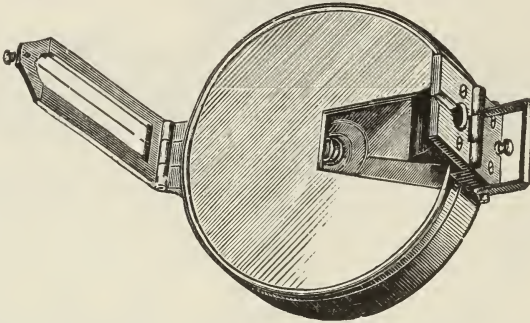
Note: For information relative to staff and tripods which No. 5348-2F will fit, see page 451.
For Flexible (Pocket) Leveling Rods, see pages 493.

KEUFFEL & ESSER CO., NEW YORK

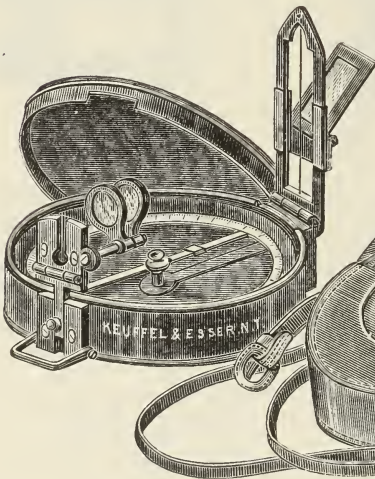
K & E

REG. U. S. PAT. OFF.

PRISMATIC POCKET COMPASSES.

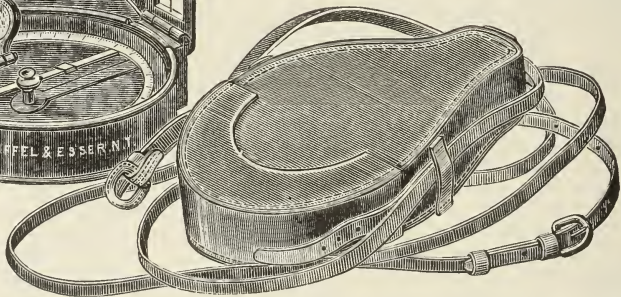


- 5411. Hutchinson's Prismatic Compass, 3 in.,** bronzed, of improved pattern nearly enclosed top, **floating aluminum dial**, bright graduations on black background, graduated to degrees and numbered 0 to 360 degrees, with 0 at the S. point, **jeweled center**, automatic stop and spring check, **prism reading glass**, hinged sight vane with vertical wire, in plain leather case with belt loop, with Directions each
- 5411 S. Hutchinson's Prismatic Compass, No. 5411,** but in sewed leather sling Case each



No. 5420.

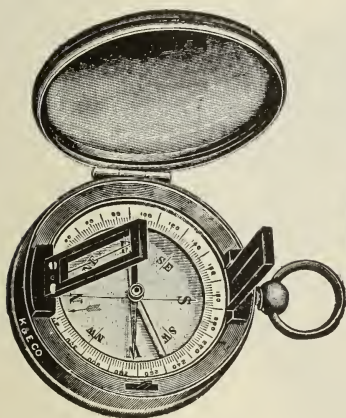
No. 5420 S.



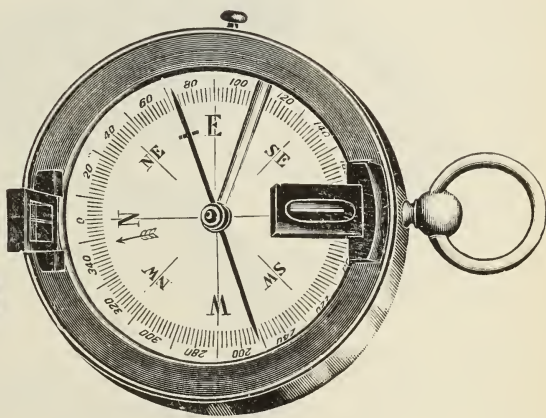
- 5420. Prismatic Compass, 2½ in.,** floating aluminum ring, graduated to half degrees, numbered 0 to 360 degrees, zero at S. point, **jeweled center**, automatic stop and spring check, hinged sight vane with vertical wire and **sliding mirror**, which can be reversed to face upwards or downwards when sighting objects much above or below the horizontal plane, **dark glasses**, for observing the sun's magnetic azimuth; with adaptor for Ball joint and socket; in plain leather case with belt loop, with Directions each
- 5420 S. Prismatic Compass No. 5420** but in sewed leather sling Case “
- Ball joint and Socket for No. 5420** (No. 5348-2, page 451), fits tripods Nos. 5352, 5359 and 5360 (see page 451). extra



POCKET SIGHT COMPASSES.



No. 5446.

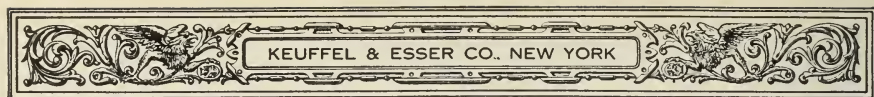


No. 5453.

5446. Nickel Silver Pocket Compass, 2 in., watch pattern, folding sights, graduated to 2 degrees and numbered every 20 degrees from 0 to 360 degrees on raised silvered ring, needle with jeweled center and stop each

5447. Nickel Silver Pocket Compass, like No. 5446 but $2\frac{3}{8}$ in. numbered every 10 degrees “

5453. Pocket Compass, $2\frac{3}{4}$ in., brass case, pull-off cover, folding sights, metal dial graduated to 2 degrees and numbered every 20 degrees from 0 to 360 degrees, edge-bar needle with jeweled center and stop “



K & E
REG. U. S. PAT. OFF.

FORESTRY COMPASSES.

No. 5600.



Attention is called to the aluminum cases of the compasses, which are a great improvement over the wooden cases formerly employed. Humidity and moisture has no effect upon the aluminum case; whereas no means has yet been devised to keep the wooden case from warping out of shape, with the consequent loosening of the glass and the rusting of the needle and its pivot.

Each instrument is furnished with eyes on the edges, through which a cord can be attached for suspending the compass from the neck of the user. This leaves both hands free when notes are to be entered.

These compasses are arranged so that the declination of the needle can be set off.

- 5600.** Forestry Compass, needle 2 in., with jeweled center and automatic stop, graduated on raised metal ring to degrees, numbered 0 to 360; aluminum case, with black hardened surface, with sighting line on lid. each
- 5600 C.** Forestry Compass, like No. 5600, but with Clinometer reading to 1° from 0 to 90 degrees in both directions each
- 5600 X.** Forestry Compass, like No. 5600, but numbered in quadrants “
- 5600½.** Forestry Compass, like No. 5600, but needle 2½ in., numbered 0 to 360 “
- 5600½X.** Forestry Compass, like No. 5600½, but numbered in quadrants “

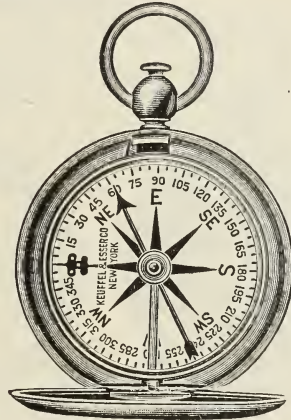
KEUFFEL & ESSER CO., NEW YORK

POCKET COMPASSES.

WATCH PATTERN, HUNTING CASE.

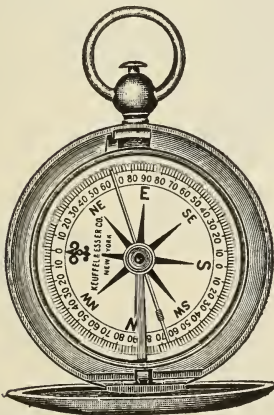


No. 5612.

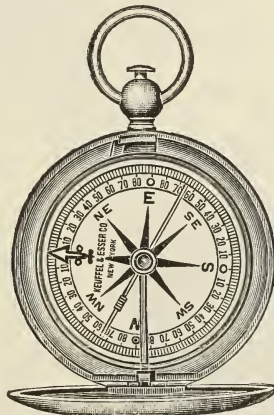


No. N5615.

- 5612.** Pocket Compass, nickel silver, watch-pattern hunting case, $1\frac{3}{4}$ in., floating dial graduated every 5° , numbered every 15° from 0 to 360° . Jeweled center and stop each
- N5615.** Pocket Compass, like No. 5613, but flat needle, with jeweled center and automatic stop, and numbered at every 15 degrees from 0 to 360° each



No. 5613



No. 5613 R.

- 5613.** Pocket Compass, nickel silver, watch-pattern hunting case; $1\frac{3}{4}$ in., etched metal dial silvered and graduated every 2° , numbered in quadrants every 10° . Edge-bar needle, weighted at north end, with jeweled center and automatic stop each
- 5613 R.** Pocket Compass, nickel silver, watch-pattern hunting case, $1\frac{3}{4}$ in., metal dial, silvered, and graduated every 2° , numbered in quadrants every 10° . Edge-bar needle, weighted at north end; with jeweled center and stop. Radium luminous indicator for night observation. each

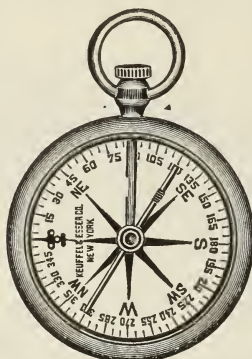
KEUFFEL & ESSER CO. NEW YORK

POCKET COMPASSES.

WATCH PATTERN, OPEN FACE.



No. 5622.



No. 5623.

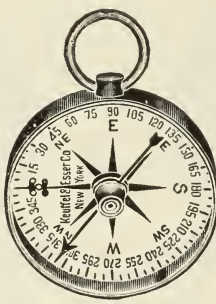


No. 5625.

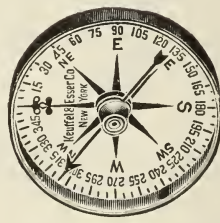
5622. Pocket Compass, open face, nickel silver case, $1\frac{3}{4}$ in., floating dial graduated every 5° , numbered every 15° from 0 to 360° ; with jeweled center and stop each
5623. Pocket Compass, open face, nickel silver case, $1\frac{3}{4}$ in., etched metal dial, silvered, graduated every 5° , numbered every 15° from 0 to 360° . Edge bar needle, weighted at north end; with jeweled center and stop each
5625. Pocket Compass, like No. 5623, but flat needle with jeweled center and stop each



No. 5622 R.



No. 5628.



No. 5629.

- 5622 R. Pocket Compass, like No. 5622, but with radium luminous indicators for night observation each
5628. Pocket Compass, open face, $1\frac{1}{2}$ in., with knob and ring, black finish, cardboard dial graduated every 5° , numbered every 15° from 0 to 360° . Flat needle without stop; jeweled center. each
5629. Pocket Compass, like No. 5628, but without knob and ring, . each

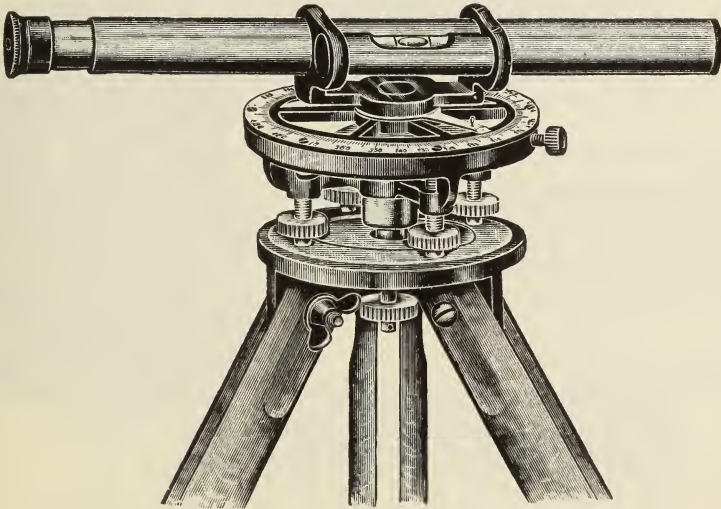
KEUFFEL & ESSER CO., NEW YORK

FAVORITE FARM LEVELS.

TRADE MARK

Favorite Farm Levels Nos. 5691 and 5693 are designed to meet the demand for reliable and durable instruments at a price within the reach of every Farmer, Landscape Gardener, Roadmaker, and others who do not require the accuracy obtained through the use of the Engineer's or Architect's levels. They have proved very useful in draining, ditching and roadwork, and for laying out and terracing parks, gardens, farm lands, etc.

The printed Description of the Instruments and plain Directions for their use have been written expressly for those who are not surveyors; and are free from technical terms. By following these instructions, good results can be obtained even by those who have had no professional training and who are not familiar with land surveying.



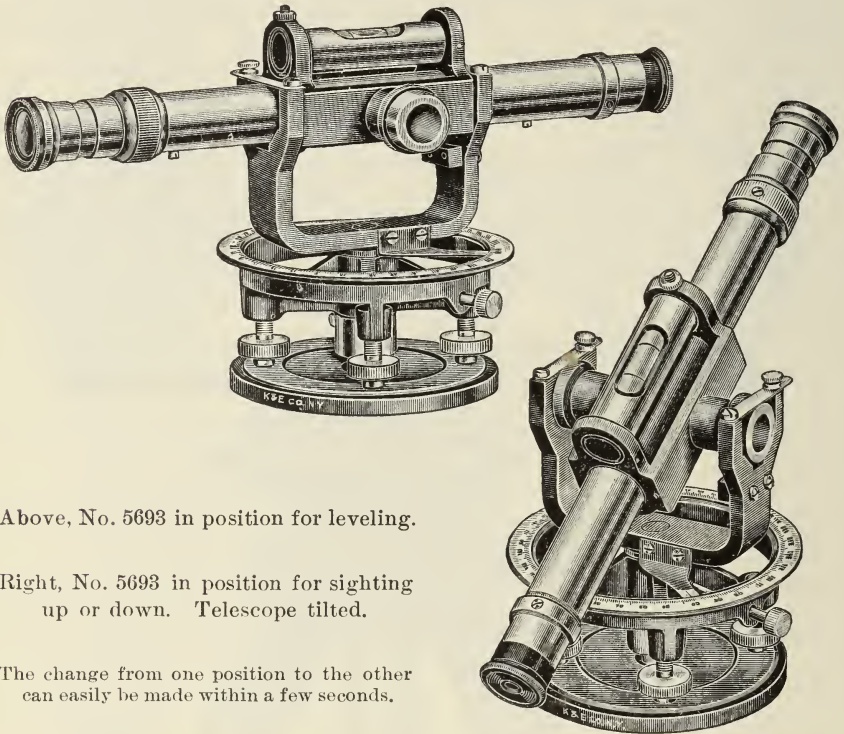
No. 5691.

5691. Favorite Farm Level. Telescope 10 in., with good lenses, showing objects erect; **MAGNIFYING POWER** about 8 diameters; with vertical and horizontal cross-hairs; **SPIRIT LEVEL** to telescope, graduated on the glass; telescope revolves in horizontal plane only and has index, and **CLAMPSCREW**, conveniently located, to lock against horizontal motion. Revolving **horizontal circle** graduated to single degrees and numbered from 0 to 360 degrees. Instrument complete in wooden box with plumb-bob; **flexible leveling rod 8 ft. divided into feet, inches and quarter inches**, tripod with folding legs, and directions for use. each



FAVORITE CONVERTIBLE FARM LEVEL.

TRADE MARK



Above, No. 5693 in position for leveling.

Right, No. 5693 in position for sighting up or down. Telescope tilted.

The change from one position to the other can easily be made within a few seconds.

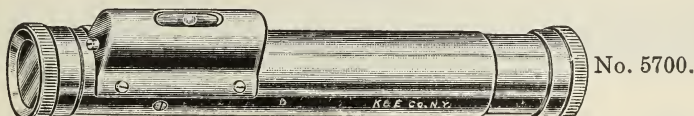
5693. Favorite Convertible Farm Level. Telescope 10 in., with good lenses, showing objects erect; cam focusing movement to objective slide (patent pending); **MAGNIFYING POWER** about 8 diameters; with vertical and horizontal cross-hairs; and **SPIRIT-LEVEL**. Revolving **HORIZONTAL CIRCLE** graduated to degrees, with index. **CLAMP SCREW**, conveniently located, to lock against horizontal motion. Instrument complete in wooden box with plumb bob; **8 ft. flexible leveling rod** divided into feet, inches and quarter inches; tripod with folding legs, and directions for use.each

Packed in strong carton for shipment.



K & E HAND LEVELS.

REG. U. S. PAT. OFF.



No. 5700.

- 5700.** Locke's Hand Level, nickel silver, with draw to eyepiece,
5 in., in leather pouch with belt loop each
- 5701.** Locke's Hand Level, brass, black finish, with draw to eyepiece,
5 in., in leather pouch with belt loop “

Nos. 5700-5701 have magnifying lens for the bubble at the end of the draw.



No. N 5702.

- N5702.** Hand Level, brass, black finish, 6 in., in leather pouch with belt loop, each

No. N5702 is an improved type of Hand Level, in which the housing of the level vial is set low upon the telescope barrel; and the half lens for magnifying the bubble is mounted directly in the barrel. This lens not only magnifies the image of the bubble, but also brings the bubble and cross line into sharper and finer focus. The eye is thus relieved of considerable fatigue, with a resulting increase in the efficiency of the observer.

- N5702D.** Hand Level, like No. N5702, with the addition of stadia lines set at ratio of 1:10 each



Diagram, showing
bubble in field of view.



No. 5703.

- 5703.** K & E Hand Level, brass, square tube, 5 in., in leather pouch . . each

In No. 5703 the reflector is a narrow prismoid, crossing the middle of the field of view so that the field appears on both sides of the reflected bubble, as shown in the above diagram. As the lower surface of the tube is flat and parallel to the axis of the spirit level, this hand level can be used also as a contact level.

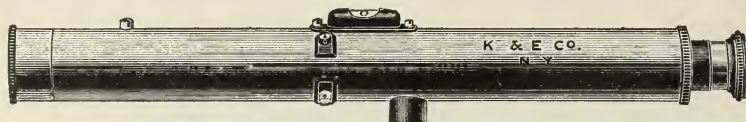
- 5704.** K & E Hand Level, brass, black finish, square cross-section, $6\frac{1}{4}$ in., with right angle sighting arrangement, in leather pouch with belt loop, each

No. 5704 is similar to No. 5712, page 464, but without the arc. By pulling out the prism reflector and re-inserting it upside down the instrument becomes suitable for right angle sighting. When the slot in the bottom face is turned outward, and the cross-wire brought upon the line from which the right angle is to be turned, the reflected image of rod or other object at right angles to the line of sight will be in line with the cross-wire.

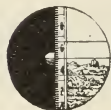
KEUFFEL & ESSER CO., NEW YORK

K & E STADIA HAND LEVEL (Telescopic).

REG. U. S. PAT. OFF.



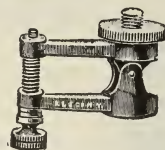
No. 5706.



Appearance of field.



No. 5348-2.



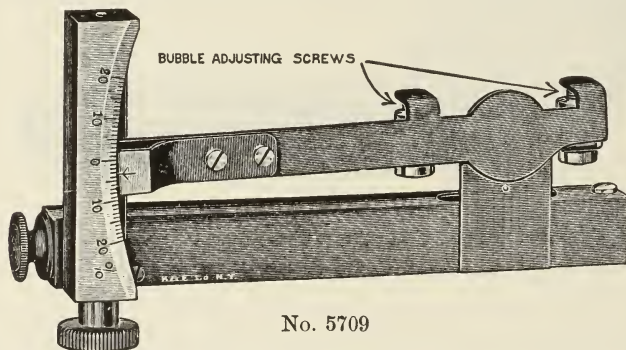
No. 5375 L. ($\frac{1}{3}$ size)

- 5706. Stadia Hand Level**, telescope 10 in., stadia hairs fixed, ratio 1:100, object-glass 1 in.; magnifying power about 7 diameters; with ball joint and socket, No. 5348-2, in plain leather-covered (morocco finish) case, velvet-lined each
- 5706S. Stadia Hand Level**, like No. 5706, but in leather Sling Case “
- 5375 L. Micrometer Leveling Attachment** for Nos. 5706 and 5706S. “

Note:—See page 451 for information as to fitting of ball joint and socket No. 5348-2 to staff and tripods.

The Stadia Hand Level has an achromatic erecting 10-inch telescope with 1-inch objective. The objective is drawn out for focusing and the eyepiece is adjustable for defining the stadia hairs. This instrument will be found very useful for preliminary surveys, cross-sectioning, railroad construction work, exploration of streams for water power, etc. When set on a staff or tripod, a fairly accurate line of levels can be run. It is easily carried, as it weighs scarcely 1½ pounds. In connection with a flexible leveling rod it constitutes a good outfit for preliminary work, on account of its light weight and ease of manipulation.

FALLIS REFLECTING HAND LEVEL



No. 5709

- 5709. Fallis Reflecting Hand Level**, 5 in., with arc graduated to per cent. of gradient, in single per cents up to 20 per cent above and below the horizontal; in plain leather case with belt loop. each

This level is intended primarily for survey work about roads, railroads etc., but may be employed for the same purposes as any clinometer where the slopes involved are not greater than 11° 15' above or below the horizontal. The bubble-tube is large and has adjustment devices similar to those on an engineer's transit. The limb is graduated in per cent of grade to 1%; but it is possible to estimate easily to the nearest 0.2 of one per cent. The movable arm, which carries the level vial and pointer, is operated by means of a tangent screw, whose head is at the base of the graduated limb. Hence the bubble may be brought slowly and uniformly to center. The location of the limb and tangent screw at the sighting end permits the use of both hands in directing it steadily upon the mark while bringing the bubble to the central position. All of these features make possible a considerable degree of precision in measuring slopes and gradients.

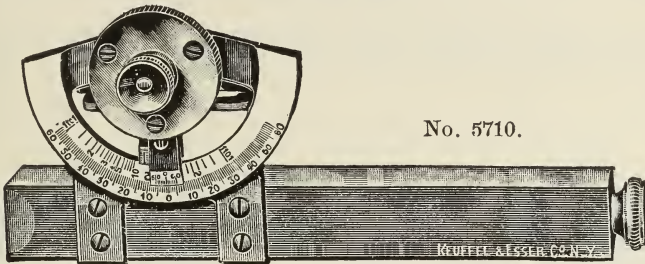
For Jacob Staff and Tripods, see page 451.

For Flexible Leveling Rods, see page 493.

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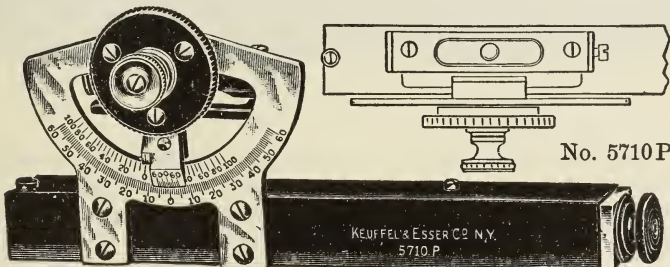
K & E ABNEY HAND LEVELS.

REG. U. S. PAT. OFF.



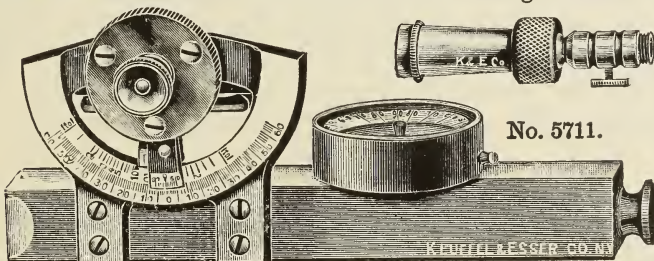
No. 5710.

5710. Abney Reflecting Level, 5 in., improved, with arc graduated to degrees for 60°, vernier reading to 10 minutes, also slopes 1:1 to 1:10 for both elevation and depression; in plain leather case with belt loop, each
- 5710S. Abney Level No. 5710, but in sewed leather Sling Case “



No. 5710P

- 5710P. Abney Reflecting Level, 5 in., improved, with arc graduated to degrees for 60°, vernier reading to 10 minutes, also per cent of grade reading to 5% from 0 to 100% for both elevation and depression; in plain leather case with belt loop each
- 5710PS. Abney Level No. 5710P, but in sewed leather Sling Case “



No. 5711.

5711. Abney Reflecting Level, 5 in., arc graduated like No. 5710, bar-needle Compass 1½ in., ball joint and socket No. 5348-1 for Jacob staff mounting; in plain leather case with belt loop, each
- 5711S. Abney Level No. 5711 but in sewed leather Sling Case “

Note: - For information relative to fitting ball joint and socket No. 5348-1 to tripods, see page 451.

5714. Micrometer Leveling Attachment (for Abney Level No. 5711,) bronze, in leather Case each



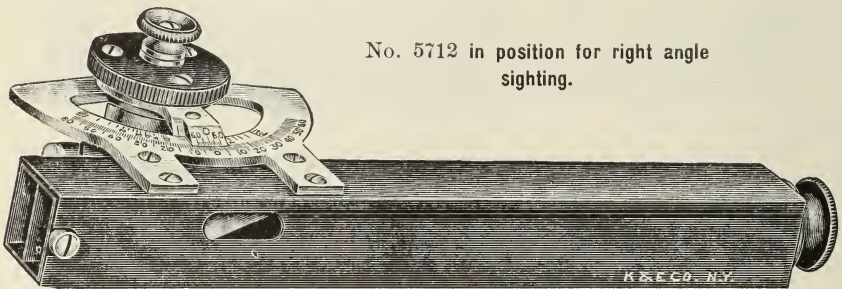
No. 5714.
(¼ size).



K & E

REG. U. S. PAT. OFF.

ABNEY HAND LEVELS.



No. 5712 in position for right angle sighting.

5712. Abney Reflecting Level, 6½ in., improved, with right angle sighting arrangement; arc graduated to degrees for 60°, vernier reading to 10 minutes, also slopes 1:1 to 1:10, for both elevation and depression; in plain leather case with belt loop each

5712S. Abney Level No. 5712, but in sewed leather Sling Case “

5712P. Abney Reflecting Level, 6½ in., improved, with right angle sighting arrangement; arc graduated to degrees for 60°, vernier reading to 10 minutes, also per cent of grade reading to 5% from 0 to 100% for both elevation and depression; in plain leather case with belt loop each

5712PS. Abney Level No. 5712P but in sewed leather Sling Case “

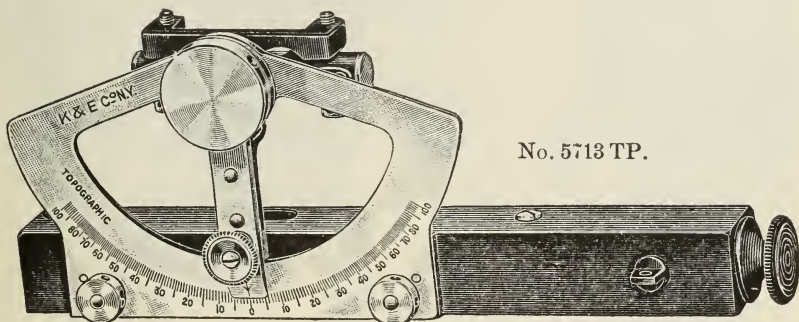
Nos. 5712 and 5712P are constructed with a slot in the bottom face, which is of exactly the same size and location as the slot in the top face through which the bubble is reflected. By pulling out the prism reflector and re-inserting it upside down the instrument becomes suitable for right angle sighting. When the slot in the bottom face is turned outward, and the cross-wire brought upon the line from which the right angle is to be turned, the reflected image of a rod or other object at right angles to the line of sight will be in line with the cross-wire.



K & E

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TOPOGRAPHIC ABNEY LEVEL



No. 5713 TP.

The K & E Topographic Abney Level, as made by us for the U. S. Forest Service, is an improved form of Abney level, with draw to eye piece. Its length is $6\frac{1}{4}$ in., extending to $7\frac{3}{8}$ in. The bubble tube is large and has adjustment devices similar to those on the bubble tubes of a transit. The long sighting tube and larger bubble lessen the strain upon the eye, and give greater steadiness to the instrument. The radius of the graduated limb is $1\frac{3}{4}$ in., or about 75 per cent greater than that of the ordinary Abney level. The wide spaces between the graduations make unnecessary the use of a vernier—a point which often appeals to the non-technical user.

5713PD. Topographic Abney Level, arc in per cent of grade on one side of limb, degrees on other side; in sewed leather case with belt loop.

5713TP. Topographic Abney level, arc in per cent of grade on one side of limb, topographic arc on other side; in sewed leather case with belt loop.

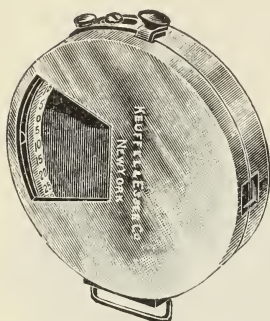
The graduations on the Topographic Arc indicate the difference in elevation in feet for one chain (66 ft.) of horizontal distance. When used in conjunction with the Topographic Tapes Nos. 7697-2 to 7697-5 described on page 357, the labor of chaining is much expedited in steep and broken country.

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K & E

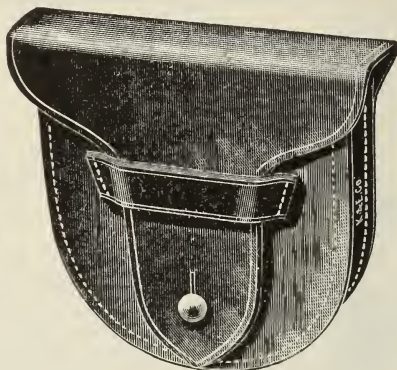
REG. U. S. PAT. OFF.

MILITARY CLINOMETER.



Appearance
of field.

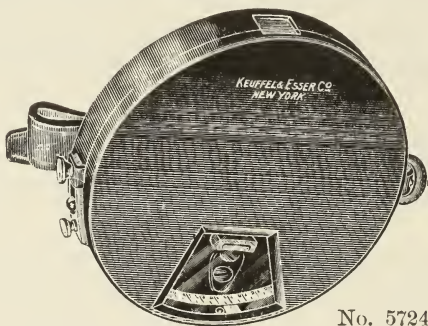
No. 5721.



- 5721. Military Clinometer** as made by us for the U. S. Army, metal case $2\frac{3}{4}$ in. diam., sensitive gravity (pendulum) clinometer, graduated 45° in both directions to single degrees, numbered at every 5 degrees, with automatic stop; in sewed leather Case with belt loop; Directions each

The scale reading and the sighted object are seen simultaneously (see cut). The instrument has a fiducial edge for use as contact clinometer, and wire loop for attaching a carrying strap.

HYPSONETER AND GRADEMETER.



No. 5724.

- 5724. Hypsoneter and Grademeter** as manufactured by us for the U. S. Forest Service; metal case $3\frac{3}{4} \times \frac{1}{4}$ in., sensitive gravity (pendulum) clinometer; graduated to per cent of angle, from 0 to 50% for depression and from 0 to 200% for elevation. Spring stop released by pressing knob; sliding lock for spring stop. Leather strap handle; with directions each

This instrument was designed and patented by an officer of the U. S. Forest Service. The line of sight passes through the diameter of the box, from a peep sight in one side to a small glazed window in the opposite side. A segment of the cover, closed by transparent celluloid, admits light to the graduations, which are seen simultaneously with the sighted object.

ANGLE MIRRORS AND ANGLE PRISMS.

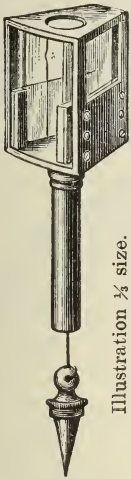


Illustration $\frac{1}{2}$ size.

No. 5750.

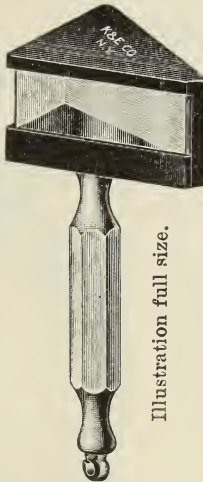


Illustration full size.

No. 5762.

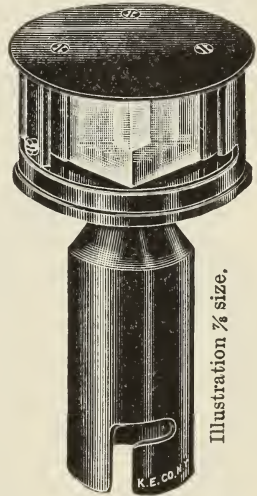


Illustration $\frac{1}{2}$ size.

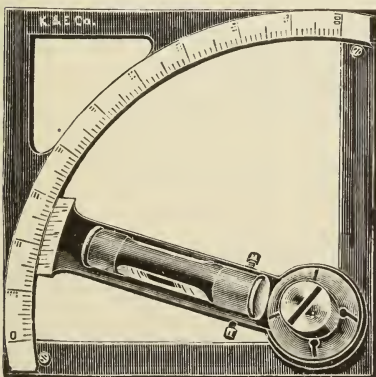
No. N5765.

5750. Angle Mirror, for angles of 90 degrees, with small plumb bob, which is threaded for stowing in the handle. The handle can be unscrewed and stowed in frame of instrument; in Pocket Case each

5762. Rectangular Prism, for angles of 90 degrees; in Pocket Case “

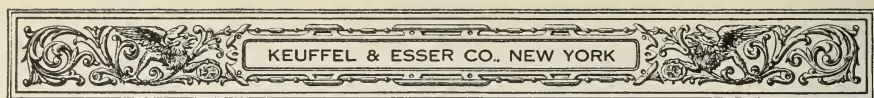
N5765. Pentagonal Prism, for angles of 90 degrees, with detachable Handle “

In No. N5765 the reflected immovable image is much more distinct and much better illuminated than in triangular prisms, while its size is about twice that produced by the latter. These pentagonal prisms are therefore, far superior to triangular prisms of similar size and give more accurate results, with easier manipulation.



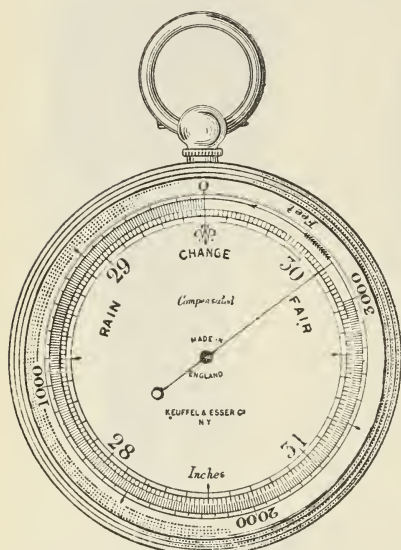
SLOPE LEVEL.

5805. Clinometer or Slope Level, bronze square frame 4 in., with silvered arc graduated to degrees, vernier reading to 5 minutes, fine adjustable spirit level graduated on the glass; in leatheret covered Case each

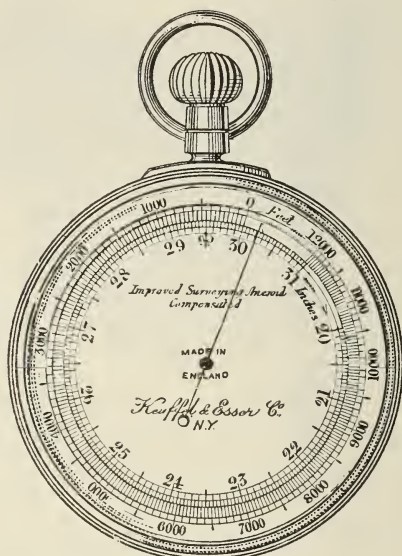


SURVEYING BAROMETERS.

FOR MEASURING ALTITUDE AND ATMOSPHERIC PRESSURE.



No. 5880.



No. 5892.

5880. Pocket Pattern, brass case $2\frac{3}{4}$ in. diameter, silvered dial, revolving altitude scale 3000 feet, divided to 10 ft., compensated; in morocco Case each

5881. Like No. 5880, but altitude scale 6000 feet, div. to 25 ft., “

5890. Pocket Pattern, bronzed case $2\frac{3}{4}$ in. diameter, silvered dial, revolving altitude scale 3000 feet, div. to 10 ft., operated by rack and pinion, revolving pointer (index) operated separately by milled ring, compensated; in sewed leather Sling Case each

5891. Like No. 5890, but altitude scale 6000 feet, div. to 25 ft., “

5892. “ “ 5890, “ “ “ 12000 “ div. to 50 ft., “

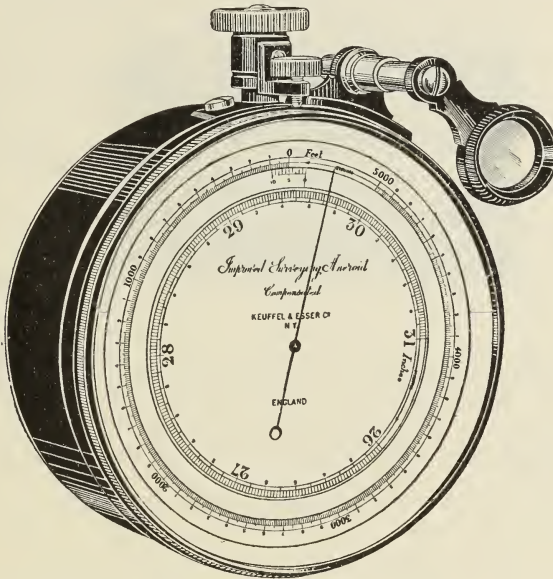
Since the altitude scale and the pointer of Nos. 5890 to 5892 have separate actions, these instruments can also be used as with fixed altitude scale.

Sewed leather Sling Cases for Barometers Nos. 5890, 5891, and 5892 each

KEUFFEL & ESSER CO., NEW YORK

SURVEYING BAROMETERS.

FOR MEASURING ALTITUDE AND ATMOSPHERIC PRESSURE.



No. 5915.

- 5909.** Surveying Barometer, bronzed case $3\frac{1}{2}$ in. diameter, silvered dial, graduations on raised ring, revolving equidistant altitude scale 6000 feet, which can be fixed by means of control screw with milled head, vernier scale operated by rack and pinion, reading to 2 feet, compensated for temperature, adjustable reading lens, carrying ring; in leather Sling Case each
- 5915.** Surveying Barometer, bronzed case $4\frac{3}{4}$ in. diameter, silvered dial, graduations on raised ring, revolving equidistant altitude scale 5000 feet, which can be fixed by means of control screw with milled head, vernier scale operated by rack and pinion, reading to 1 foot, compensated for temperature; adjustable reading lens; in leather Case each
- 5920.** Mining Barometer, bronzed case 5 in. diameter, silvered dial, graduations on raised ring, fixed altitude scale 2000 feet below and 4000 feet above sea level, vernier scale operated by rack and pinion, reading to 1 foot, compensated for temperature; adjustable reading lens; in leather Sling Case each

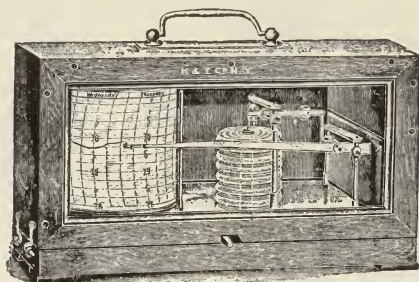
Sewed leather Sling Cases for No. 5909 "

" " " " " " 5915 and 5920 "

The instruments Nos. 5909 to 5920 are constructed especially for ascertaining slight variations in gradients, levels, etc. Their extreme sensitiveness is of great value in mining and surveying work generally. A valuable improvement in these instruments is an arrangement of the scale of altitude permitting the reading by vernier, formerly impracticable owing to the usual altitude scale being a gradually diminishing one to which a vernier could not be applied. In the above instruments the action has been adjusted to give accurate readings upon a uniform scale of altitudes, the barometrical scale of inches having been made progressive so as to afford the correct relative readings with the scale of altitudes.



RECORDING BAROMETER.

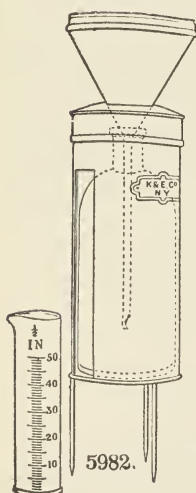


No. 5941

5941. Barograph, large size, registering one week over a range of 3 inches atmospheric pressure, by twentieths inches up to 6200 ft. above sea level. Series of 8 vacuum boxes, cylinder $3\frac{3}{8}$ in. diameter \times $3\frac{3}{8}$ in. high. In polished mahogany Case with handle, hinged cover with glass-paneled front. With Charts for one year and bottle of ink . . . each

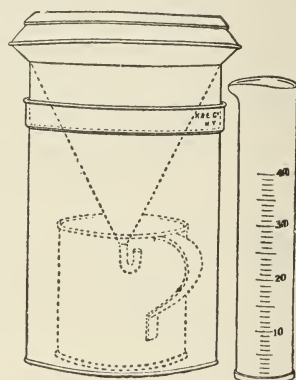
Extra Charts for period of one year for No. 5941 per set

RAIN GAUGES.



5982.

5984.



5982. Rain Gauge, Symon's model, with prongs to prevent tipping, with graduate reading to $\frac{1}{100}$ in., . . . each
 5982G. Extra Graduate for No. 5982 "
 5984. Rain Gauge, Glaisher's model, a very reliable instrument, with graduate reading to $\frac{1}{100}$ in., . . . each
 5984G. Extra Graduate for No. 5984 "

KEUFFEL & ESSER CO., NEW YORK

K & E

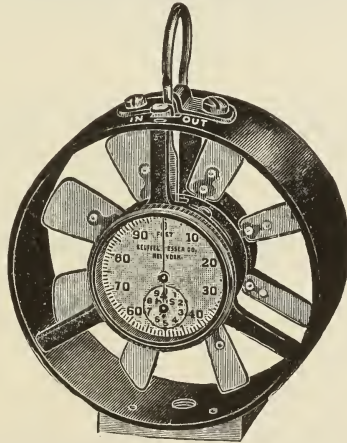
REG. U. S. PAT. OFF.

ANEMOMETERS.

Anemometers are used for the measurement of the velocity of air currents in mines, tunnels, sewers, public buildings, hospitals, schools, etc. As now constructed by us, all of these instruments embody a number of important mechanical improvements, among which may be mentioned the **zero setting arrangement**. Setting the instrument to zero before each reading does away with the necessity of taking a previous reading into consideration and lessens the liability of error. This is instantaneously done on K&E instruments by simply pushing a lever. By the operation of another lever, known as the disconnecter, the movement of the registering hands can be stopped at any point. K&E instruments have jewel bearings and are constructed to **measure air velocities** as follows:

Nos. 5953 to 5965	200 to 2000 feet per minute
No. 5966	500 " 6000 " " "
No. 5967	75 " 500 " " "

They should not be used in temperatures exceeding 300° F. K&E anemometers are calibrated by direct methods, and not by comparison—i. e. each instrument is calibrated independently of all others. Each K&E anemometer is furnished with a calibration curve for the entire range of velocity; no correction being required on Nos. 5953 to 5965 inclusive, at 500 feet per minute; No. 5966, at 1000 feet per minute; and No. 5967, at 300 feet per minute.



No. 5953.

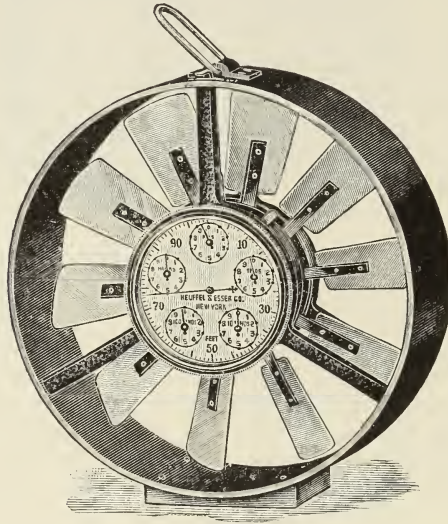
5953. Biram Anemometer, 3 in. diam., for measuring air velocities between 200 and 2000 feet per minute, reading to 1000 feet by 1 foot intervals, with disconnecter and lever zero setting arrangement; in leather pouch with belt loop each

KEUFFEL & ESSER CO. NEW YORK

K & E

REG. U. S. PAT. OFF.

ANEMOMETERS.



No. 5965.

5957. Biram Anemometer, like No. 5953, but 4 in. diam., reading to 1000 feet; in Case each
5958. Biram Anemometer, like No. 5953, but 4 in. diam., reading to 100,000 feet, with Zero Setting arrangement; in Case “
5963. Biram Anemometer, like No. 5953, but 6 in. diam. reading to 1000 feet; in Case “
5965. Biram Anemometer, like No. 5953, but 6 in. diam., reading to 10,000,000 feet, with lever Zero Setting arrangement; in Case “

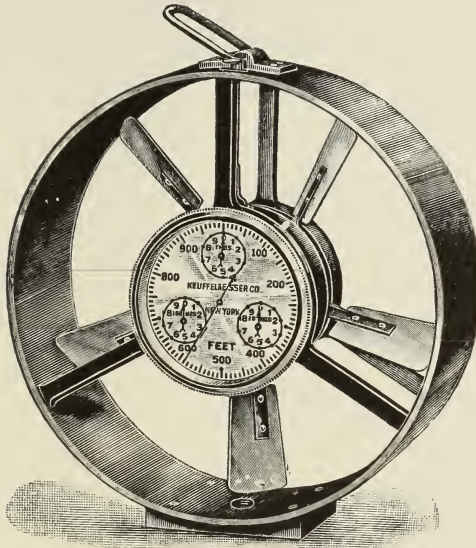


K & E

REG. U. S. PAT. OFF.

ANEMOMETERS.

HIGH SPEED ANEMOMETER.



No. 5966.

The K & E High Speed Anemometer is intended for use in measuring the velocities of air blasts or gases moving at high velocities, such as are encountered in blast furnace work or similar operations. The most substantial and durable construction is employed for all parts, insuring reliable results. It may safely be used in temperatures up to 300° F.

5966. High Speed Anemometer, for measuring air velocities up to 6000 feet per minute; 6 in. diameter, registering to 1,000,000 feet by 10 ft. intervals, with disconnecter and zero-setting arrangement; in Case each

LOW SPEED ANEMOMETER.

The K & E Low Speed Anemometer is similar to No. 5963, but more delicate in construction, for measuring air velocities from 75 to 500 feet per minute. This instrument was developed for measuring air currents at the registers of heating and ventilating systems, in schools, public buildings, etc.

5967. Low Speed Anemometer, 6 in. diam., reading to 1000 feet by 1 foot intervals, with disconnecter and zero setting arrangement, in Case each

CURRENT METERS.

The current meters illustrated and described in the following pages represent the most improved instruments of this type, and in selecting them all the requirements of the Engineer and Hydrographer have been taken into careful consideration. With this type of instrument, only the velocity of the water parallel to the horizontal axis of the instrument is measured, thereby reducing to a minimum the disturbing influences of whirls and cross currents, and making it possible to measure any desired component of the water's velocity; a feature that is of obvious importance.

Special attention is called to instruments Nos. 6019½ and 6025, which are provided with watertight contact chambers to avoid the liability of error due to short circuiting in salt water or water polluted with sewage.

Marked improvements have been introduced in the various constructive details. Wherever possible ball and agate bearings are used, and these are protected by the most approved means against the entrance of silt and other injurious substances. All parts subject to wear or liable to injury, are substantially constructed. **These instruments are rated under actual conditions of use and furnished with constants for the calculation of results.**

These instruments have been extensively used in this country by the following:

U. S. Government Departments,
City Water Departments,
City Sewer Departments,
Boards of Health,
Irrigation Companies,
Power Companies,
Water Companies,
Public Service Companies,
Engineering Companies,
Construction Companies,
Dredging Companies,
Mining Companies,
Turbine Manufacturers,
Universities;

In fact, by all those to whom the correct measurements of the flow of open streams is essential.

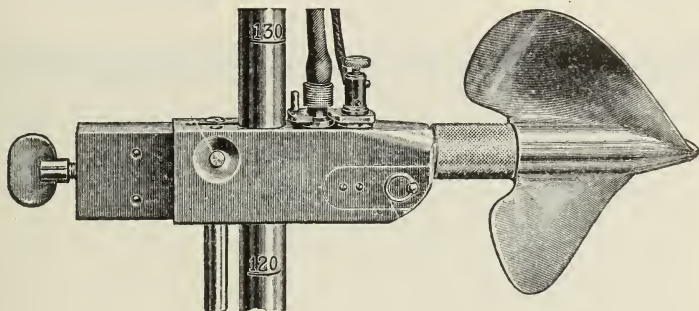
They have also had extensive use abroad, by:

Swiss National Hydrography,
The French Service d'Etudes des Grandes Forces Hydrauliques,
Transvaal Irrigation and Water Supply Department,
Russian Administration of Roads and Waterways,
The Hydraulic and Engineering Laboratories of the Technical High Schools of Berlin, Darmstadt, Trondhjem, Zurich,
The Technical State Schools of Chemnitz,
Engineering School of Moscow,
The Hydraulic Works at Trondhjem, Malmoe, Chevres, Bozen, Meran, Bremen, Munich, Beznau-Loentsch and Rheinfelden,
The Netherlands Government, Batavia,
The Japanese Government,
and many private interests.

We are prepared to furnish, upon order, any accessory for these meters that we do not regularly carry.

KEUFFEL & ESSER CO., NEW YORK

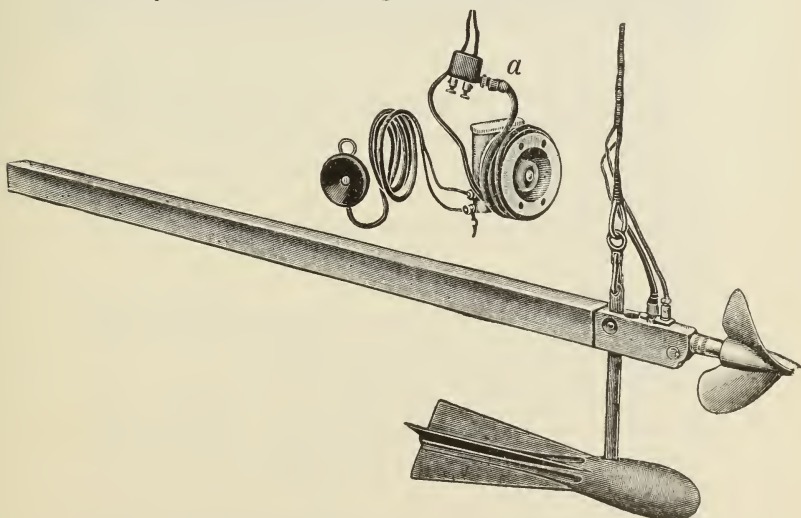
CURRENT METER OUTFIT



No. 6019½ arranged for pole suspension.

6019½. CURRENT METER OUTFIT. Complete for Both Pole and Cable Suspension.

Electrical Current Meter with waterproof contact chamber. For use in salt or impure water where conductivity would produce short circuiting, and, consequently, errors in observations. Propeller about 5 in. diameter; axis in ball bearings. Propeller pitch 0.9 ft. One extra propeller 1.5 ft. pitch. Will start at velocities as low as 0.10 ft. per second. Contact every ten revolutions. Extra pin on contact wheel for contact every five revolutions. Extra contact wheel for short and long signals, by means of which reverse currents may be detected. Body of current meter smooth and compact, offering the least resistance to the flow of water, and reducing to a minimum the liability of the adherence of grass, weeds, etc.



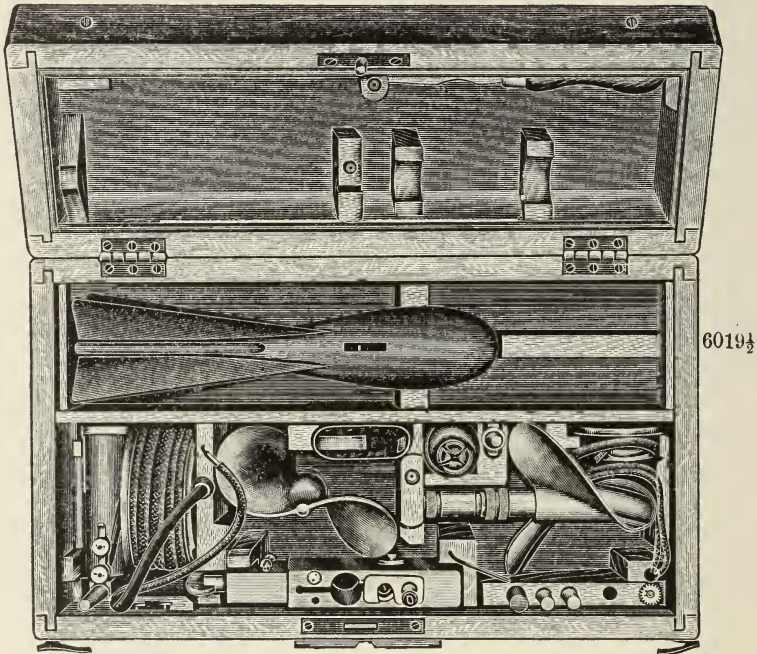
In the above illustration (a) shows the telephone receiver connected to the battery case, and the bell cable connected with the plug at the end of the suspension cable. (b) shows the meter when assembled for cable suspension. The two propellers of different pitch permit of the use of the meter under considerable ranges in velocity.

Description of No. 6019½ continued on page 476.



CURRENT METER OUTFIT.

(CONTINUED)



The axis of this Current Meter is stationary and the propeller rotates on it on ball bearings of hardened steel. These ball bearings guarantee a smooth running of the propeller; and will last indefinitely if given proper care.

Electric battery case, nickel-plated, with bell, battery and 9 ft. double core wire.

Reserve battery.

Telephone receiver with wires and connections.

Pointer with bracket for battery case.

Hanger for sinker.

Sinker of 11 lbs. weight.

20 feet of three strand (two copper, one steel, tensile strength 300 lbs.) cable with electrical terminals, snap hook, and carabine swivel for suspending meter.

Two safety pins to prevent propeller from striking bottom, or from being struck from above.

Screw driver. Key wrench. Bottle of oil. Oil can. Extra ball bearings.

All of the above, including meter, in polished hardwood box, $17\frac{1}{2} \times 9\frac{3}{4} \times 6$ in., with lock and carrying handle. Weight $28\frac{1}{4}$ lbs.

Pole, 8 ft., of steel tubing, $\frac{3}{4}$ in., in five sections, with steel point and detachable base plate, marked in feet and inches.

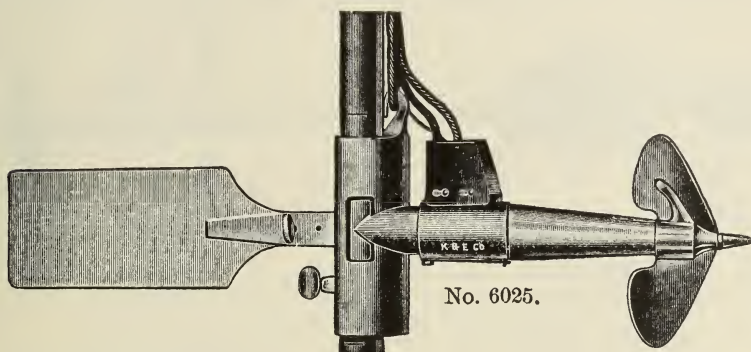
Tail, in two sections, total length 3'-3'', brass tubing $1\frac{1}{8} \times \frac{7}{8}$ in., nickel plated.

Pole and tail in canvas bag with leather caps and carrying strap. Length of cover, 2 ft. Weight, 11 lbs.

6019½. Complete outfit each

KEUFFEL & ESSER CO., NEW YORK

MAGNETIC CURRENT METER WITH ELECTRICAL REGISTERING DEVICE



6025. Electrical Current Meter with magnetic contact device.

Especially suitable for use in salty or acidiferous water of considerable depth. All contact points enclosed in hermetically sealed case and actuated from without by powerful permanent magnet mounted on inner end of propeller axis. Contact every 25th revolution or every single revolution, as desired. Propeller $6\frac{1}{2}$ in. diameter, pitch about 1.7 ft.; axis mounted in ball and agate bearings. Will start at velocities as low as 0.14 ft. per second. Instrument fits on pole $1\frac{1}{4}$ in. diameter. The body of this instrument (carrying the propeller axis and contact chamber) can be detached and attached to a hollow metal rudder to form a Floating Current Meter with cable suspension (see No. 6026).

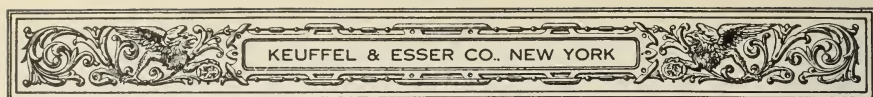
It may be raised or lowered to any position on the pole without raising the latter. Hence, it is suitable for use in streams of considerable depth.

Instrument complete, in hardwood Box, with cable pulley, cable clamp and pointer, oil can and screw-drivers. Dimensions of box, about $17\frac{1}{2} \times 6\frac{3}{4} \times 9\frac{1}{2}$ in. Weight, about 22 lbs. Also 40 feet of reinforced electrical cable, with three insulated copper strands and one steel strand, of about 250 lbs. tensile strength, Weight, $2\frac{1}{2}$ lb. each

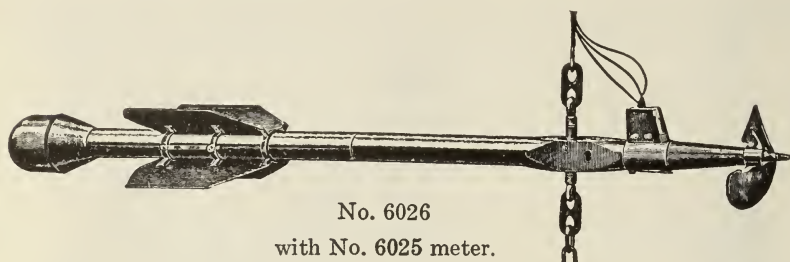
The pole is not included.

For measurement from a pole this instrument requires a bell and battery or, preferably, accessory No. 6028 P.

6025 P. Pole for No. 6025, 20-foot circular tube, graduated to feet and tenths, in two sections, with guide bar, steel point and detachable baseplate. Weight, 36 lbs. each



FLOAT FOR CURRENT METER



No. 6026
with No. 6025 meter.

- 6026. Suspension with movable Rudder**, in two sections with Joints for cable suspension and for suspending additional ballast, for Meter No. 6025; in hardwood Case $37\frac{3}{4} \times 11\frac{1}{2} \times 8\frac{1}{2}$ in., with arrangements for holding current meter No. 6025 and the necessary accessories for cable suspension. Total weight of suspension 28 lbs. Total weight of case and suspension, 49 lbs.....each

The meter is shown for purposes of illustration and is not included in the price.

ACCESSORIES FOR CURRENT METERS

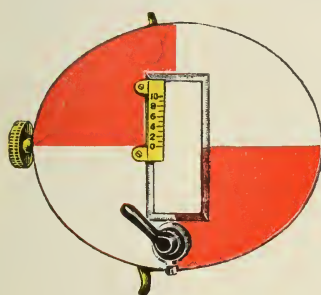
- 6028L. Electric Register**, two dials, registering up to 10,000 revolutions, with large enamelled faces, in polished hardwood case; with switch. Serves for counting revolutions of the screw. Electric resistance, 9 ohms. (Capacity, 15 registrations per second with meter having enclosed contact device, and about 5 registrations per second with open contact device.) Dimensions, $5\frac{3}{4} \times 4\frac{1}{2} \times 2\frac{3}{4}$ in. Weight, 3 lbs.each
- 6028N. Electric Bell**each
- 6028O. Dry Cells** “
- 6028P. Electric Register** No. 6028 L, Bell No. 6028 N and 4 Dry Cells No. 6028 O, and connecting wire; in hardwood case, $17\frac{1}{2} \times 6 \times 8\frac{1}{4}$ in. Weight, $19\frac{1}{2}$ lbs. “
- 6028S. Insulated Copper Cable** (two strands) for batteryper foot
- 6028T. Lead Sinker**, of 55 lbs. weight, with electric groundplate contact, and connection for hanging wire; in suspension No. 6026. In strong case $12 \times 12 \times 10$ in. Total weight, 75 lbs.each
- 6028W. Canvas Bag** for pole No. 6025P, with leather caps and carrying strap “

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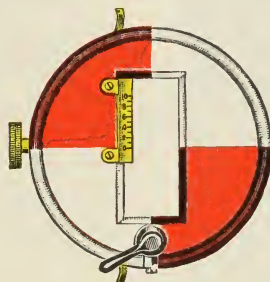
K & E TARGETS

REG. U. S. PAT. OFF.

The **Micrometer Target** has an arrangement for setting the target consisting of an eccentric controlled by a small handle placed at the lower edge of the target, which slides the target on an inner metal sleeve and permits of rapid and accurate setting. Since the micrometer arrangement can be operated only before the target is clamped, the danger of accidentally moving the target after setting is eliminated.

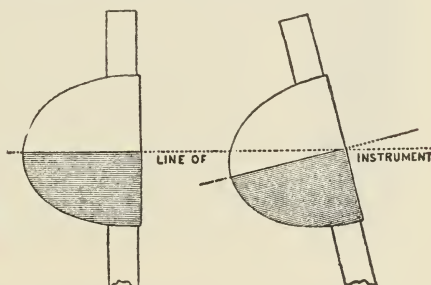
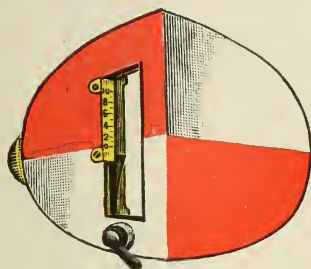


Micrometer Target of
Heavy Philadelphia Rods.



Micrometer Target of
Light Philadelphia Rods.

The **plain targets** of the heavy and light rods are of the same sizes and shapes as the targets illustrated above, but lack the micrometer arrangement.



Micrometer Angle Target

The horizontal dividing line of this target is carried over two surfaces placed at right angles to each other, thus showing a **continuous unbroken line** only when the rod is held in vertical position.

SEPARATE TARGETS.

- | | | |
|----------|---|------|
| 6245 T. | Plain Target for Rod No. 6245R. | each |
| 6254 T. | Micrometer Target for Rods Nos. 6254 R and 6254 CR. | " |
| 6254 CT. | Plain Target for Rods Nos. 6254 R and 6254 CR. | " |
| 6255 T. | Micrometer Angle Target for Rods Nos. 6254 R and 6254 CR. | " |
| 6256 T. | Micrometer Target for Rods Nos. 6256 R and 6256 CR. | " |
| 6256 CT. | Plain Target for Rods Nos. 6256 R and 6256 CR. | " |
| 6257 T. | Micrometer Angle Target for Rods Nos. 6256 R and 6256 CR. | " |
| 6258 CT. | Plain Target for Rod No. 6258 CR. | " |
| 6262 T. | Micrometer Target for Rods Nos. 6262 R, 6262 CR, 6263R-5, 6263R-9 and 6263 CR-9. | " |
| 6262 CT. | Plain Target for Rods Nos. 6262R, 6262 CR, 6263R-5, 6263R-9 and 6263 CR-9. | " |
| 6263 T. | Micrometer Angle Target for Rods Nos. 6262 R, 6262 CR, 6263 R-5, 6263R-9 and 6263 CR-9. | " |
| 6265 T. | Micrometer Mining Targ. for Rods Nos. 6263R-5, 6263R-9 and 6263 CR-9 | " |
| 6265 CT. | Plain Mining Target for Rods Nos. 6263R-5, 6263R-9 and 6263 CR-9. | " |

No. 6265T is old No. 6267½T.

In ordering separate targets give the Catalogue Number of the rod; or, if this cannot be identified, give the **length** and **exact cross-section** of the rod, and state how it is graduated.

KEUFFEL & ESSER CO., NEW YORK

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METAGRAD

REG. U. S. PAT. OFF.

LEVELING RODS.

where designated in the following pages, have the graduations and numbers applied directly upon durable corrosion-resisting metal strips with permanent white enameled faces securely attached to the rod, yet readily replaceable.

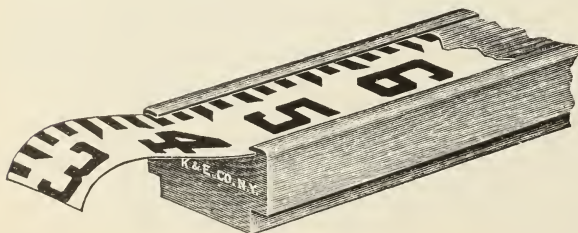
The entire metal strip is graduated, numbered and finished before it is attached to the rod, which, as in the case of the Precise Rods, serves merely as a support. The graduations on the various strips are always kept in accurate relation to one another by means of the device shown at the left; hence, the graduations are entirely independent of the expansion and contraction of the wood under changes in atmospheric humidity.

The graduations and numbers on the metal strips of the Metagrad Rod will outlast those on the all wood rod, and the strip can be readily replaced if ultimately it should show wear. This K & E development materially lengthens the useful life of the rod.

In brief, the advantages of this rod are:

1. Clearer, more legible markings.
2. Greater life for graduations and numerals.
3. Greater ease and lower costs in replacing the scale.
4. Greater accuracy.

The Metagrad Rod has a self-operating locking device which holds the sections firmly together when closed; thus necessitating the use of the clamping screw only when the rod is extended. The locking device is as shown in the illustration to the right.



KEUFFEL & ESSER CO., NEW YORK

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“C” TYPE

LEVELING RODS

PHILADELPHIA RODS

Nos. 6254C, 6254CR,
6256C, 6256CR, 6258C,
6258CR, 6262C, 6262CR,
6263C-9 and 6263CR-9.

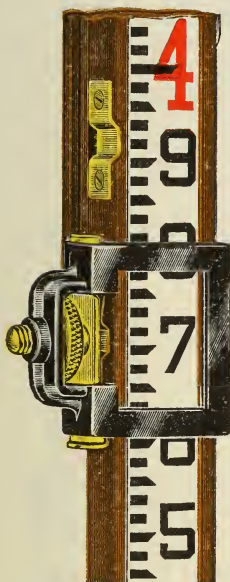
FRISCO RODS

Nos. 6268C, 6269C-12
and 6269C-15.

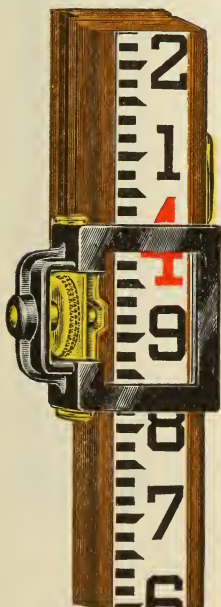
The graduations and numbers are directly on the enameled wood faces.

The rods have a plain dark finish.

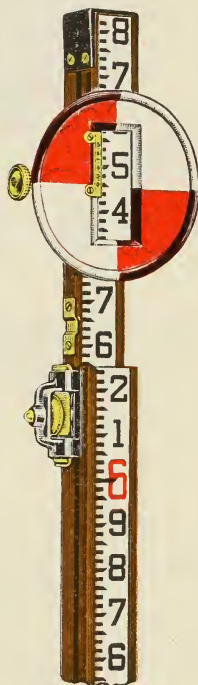
The self-operating locking device (patented) on the clamp of a “C” type rod, permits the rod to be snapped into the extended and closed positions.

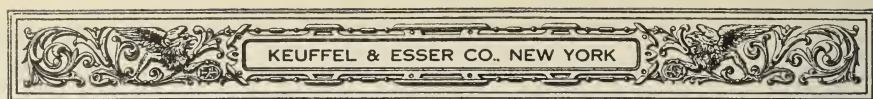


In sliding position,
before locking.



In locked position





K & E ENGLISH TYPE RODS.

REG. U. S. PAT. OFF.

Self-reading, three sections, telescoping, selected mahogany, fine hand rubbed finish, strong metal mountings, graduated on the enameled wood. Total length, closed, about 5 ft. 4 in.; width of face $1\frac{3}{8}$ to $2\frac{3}{8}$ in. A very light compact rod, suitable for work under all (including tropical) conditions. Cannot be furnished with target.

For other short rods, see Nos. 6263-5, 6263-9, 6263C-9, 6269C-12, 6269C-15 and 6276.

Graduated to .01 of a foot.

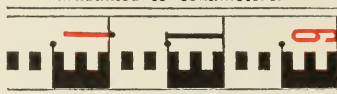


For pattern of rod see No. 6240 on page 483.

- 6240. English Self-reading Rod, telescoping, 3 sections, 5 ft. extending to 14 feet. each**

No. 6240 is old No. 6250.

Graduated to centimeters.



For pattern of rod see No. 6240 on page 483.

- 6241. English Self-reading Rod, telescoping, 3 sections, metric, 1.5 meters extending to 4 meters. each**

No. 6241 is old No. 6251.

- 6241-5. English Self-reading Rod, telescoping, 3 sections, metric, 1.8 meters extending to 5 meters. each**

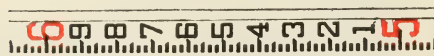
No. 6241-5 is old No. 6251-5.

DETROIT RODS

TRADE MARK

Sectional, selected white maple, straight grained, plain dark finish, Philadelphia pattern graduations to hundredths of a foot. Width over all, 2 in.; width of face, $1\frac{1}{2}$ in.; thickness, $\frac{7}{8}$ in. Flush sleeve joints of brass. Metal shoes at top and bottom. Target of box construction in the back to slip over rod, reading by vernier to 0.001 ft. Length over all, when stowed in canvas case, 5 ft. 4 in.

Graduated to .01 of a foot.



For pattern of rod see No. 6245R. on page 483.

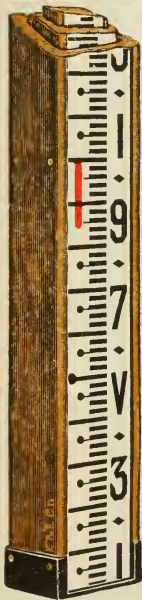
- 6245R. Detroit Rod, three sections, 12.5 ft., without target, in canvas case. each**

- 6245T. Plain Target, for Detroit Rod No. 6245R. “**

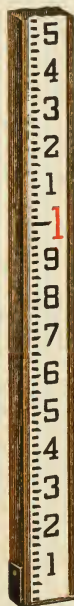
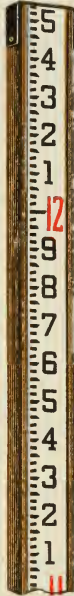
KEUFFEL & ESSER CO., NEW YORK

K & E LEVELING RODS.

REG. U. S. PAT. OFF.



No. 6240.
English
Self Reading
Description,
Page 482



No. 6245R
Detroit Rod
Description, Page 482



No. 6254
Heavy "Metagrads"
Philadelphia Rod
Description Page 484

KEUFFEL & ESSER CO., NEW YORK

K & E PHILADELPHIA RODS

REG. U. S. PAT. OFF.

Two sections; selected white maple; straight grained; protected clamp screw; vernier or target scale.

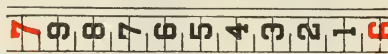
The heavy rod is longer than the light rod, when extended, but since its cross section is larger than that of the light rod, its strength and rigidity are considerably greater.

Width of face of all Philadelphia rods. $1\frac{1}{8}$ in. Total length closed: heavy rods about 7 ft. 4 in.; light rods, about 6 ft. 10 in., 5 ft. 4 in., and 3 ft. 4 in.

HEAVY PHILADELPHIA RODS

Graduated to .05 of a foot.

Target scale
reads to $\frac{1}{1000}$ ths
foot.

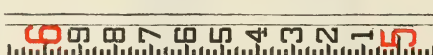


For pattern of
rod see No. 6254
on page 483.

- 6254. Heavy Philadelphia "Metagrad" Rod, metal facings (see page 480)
7 ft. extending to 13 ft., fine hand rubbed finish, with
micrometer target No. 6254 T. each
- 6254P. Heavy Philadelphia "Metagrad" Rod, like No. 6254, but with plain
target No. 6254CT in place of micrometer target No.
6254T. "
- 6254R. Heavy Philadelphia "Metagrad" Rod, like No. 6254, but without
target. "
- 6254C. Heavy Philadelphia Rod, 7 ft. extending to 13ft., plain dark
finish, with plain target No. 6254CT, "
- 6254CR. Heavy Philadelphia Rod, like No. 6254C, but without target. "

Graduated to .01 of a foot.

Vernier
reads to
 $\frac{1}{1000}$ ths foot



For pattern of
rod see No. 6256
on page 485.

- 6256. Heavy Philadelphia "Metagrad" Rod, metal facings (see page 480)
7 ft. extending to 13 ft., fine hand rubbed finish, with
micrometer target No. 6256T. each
- 6256P. Heavy Philadelphia "Metagrad" Rod, like No. 6256, but with plain
target No. 6256CT in place of micrometer target No.
6256T. "
- 6256R. Heavy Philadelphia "Metagrad" Rod, like No. 6256, but without
target. "
- 6256C. Heavy Philadelphia Rod, 7 ft. extending to 13 ft., plain dark
finish, with plain target No. 6256CT, "
- 6256CR. Heavy Philadelphia Rod, like No. 6256C, but without target. "

For extra Targets, see page 479.

For graduated replacement strips for "Metagrad" Rods, see page 490.

KEUFFEL & ESSER CO., NEW YORK

K & E LEVELING RODS.

REG. U. S. PAT. OFF.



6256.

Heavy "Metagrads"
Philadelphia Rod.

Description, page 484.



6262C

Light Philadelphia Rod.

Description, page 486.



6268C.

Frisco Rods.

Description, page 486.



6269C-12.

KEUFFEL & ESSER CO., NEW YORK

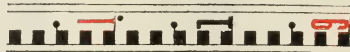
K & E PHILADELPHIA RODS. (con't.)

REG. U. S. PAT. OFF.

HEAVY PHILADELPHIA RODS.

Graduated to Centimeters

Target scale
reads to 1 mm.



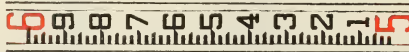
For pattern of
rod see No. 6262C
on page 485.

- 6258C. Heavy Philadelphia Rod, 2.2 meters extending to 4 meters, plain dark finish, with plain target No. 6258CT. each
- 6258CR. Heavy Philadelphia Rod, like No. 6258R, but without target “

LIGHT PHILADELPHIA RODS

Graduated to .01 of a foot

Vernier reads
to 1000th foot.



For pattern of
rod see No. 6256
on page 485.

6262. Light Philadelphia “Metagrad” Rod, metal facings (see page 480) 5 ft. extending to 12 ft., fine hand rubbed finish, with micrometer target No. 6262T. each
- 6262P. Light Philadelphia “Metagrad” Rod, like No. 6262, but with plain target No. 6262CT in place of micrometer target No. 6262T. “
- 6262R. Light Philadelphia “Metagrad” Rod, like No. 6262, without target. “
- 6262C. Light Philadelphia Rod, 6.5 ft. extending to 12 ft., plain dark finish, with plain target No. 6262CT. “
- 6262CR. Light Philadelphia Rod, like No. 6262C, but without target. “
- 6263-9. Light Philadelphia “Metagrad” Rod, metal facings (see page 480) 5 ft. extending to 9 ft., fine hand rubbed finish, with micrometer target No. 6262T. “
- 6263P-9. Light Philadelphia “Metagrad” Rod, like No. 6263-9, but with plain target No. 6262CT, in place of micrometer target No. 6262T. “
- 6263R-9. Light Philadelphia “Metagrad” Rod, like No. 6263-9, but without target. “
- 6263C-9. Light Philadelphia Rod, 5 ft. extending to 9 ft., plain dark finish, with plain target No. 6262CT. “
- 6263CR-9. Light Philadelphia Rod, like No. 6263C-9, but without target. “
- 6263-5. Light Philadelphia “Metagrad” Rod, metal facings (see page 480) 3 ft. extending to 5 ft., fine hand rubbed finish, with micrometer target No. 6262T. “
- 6263P-5. Light Philadelphia “Metagrad” Rod, like No. 6263-5, but with plain target No. 6262CT, in place of micrometer target No. 6262T. “
- 6263R-5. Light Philadelphia “Metagrad” Rod, like No. 6263-5, without target. “

MINING AND TUNNEL TARGETS

Targets Nos. 6265T and 6265CT fit any Light Philadelphia Rod. A light placed behind either of these targets throws a line of light through a narrow slit which is coincident with the horizontal division line between the red and the white quarterings.

For extra targets, see page 479.

For graduated replacements strips for “Metagrad” Rods, see page 490.

KEUFFEL & ESSER CO., NEW YORK

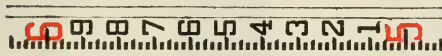
K & E FRISCO RODS.

REG. U. S. PAT. OFF. TRADE MARK

Direct reading; selected white maple, straight grained, plain dark finish; enameled metal fittings, protected clamp, Philadelphia pattern graduations. Width of face $1\frac{1}{8}$ in. Self-operating locking devices (patented) on each clamp, which permit the sections to be extended and closed without requiring the fingers to engage or disengage the spring lock. Clamping screws hold the sections firmly in the extended position. **Cannot be furnished with target.**

For other short rods see Nos. 6240, 6245, 6263-9, 6263C-9, 6263-5 and 6276

Graduated to .01 of a foot



For pattern of rod see Nos. 6268C and 6269C-12 on page 485.

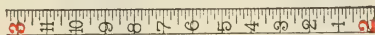
- 6268C. Frisco Rod**, two sections, 7.3 ft. extending to 13.8 ft.
Total length closed: about 7 ft. $3\frac{3}{8}$ in. each
No. 6268C is old No. 6264C.
- 6269C-12. Frisco Rod**, three sections, 4.4 ft. extending to 12 ft.
Total length closed: about 4 ft. $6\frac{1}{2}$ in. "
No. 6269-12 is old No. 6265C.
- 6269C-15. Frisco Rod**, three sections, 5.4 ft. extending to 15 ft.
Total length closed: about 5 ft. $6\frac{1}{2}$ in. "
No. 6269C-15 is old No. 6266C.

ARCHITECTS' AND BUILDERS' RODS.

Two sections, selected white maple, straight grained, brass mounted. Total length closed about 5 ft. $6\frac{1}{2}$ in.
Width of face $\frac{3}{4}$ in.

Graduated to $\frac{1}{8}$ inch.

Vernier reads to $\frac{1}{16}$ th inch.



For pattern of rod see No 6270 on page 488.

- 6270. Architects' and Builders' Rod**, $5\frac{1}{2}$ ft. extending to 10 feet, with plain target. each
No. 6270 is old No. 6280.
- 6271. Architects' and Builders' Rod**, like No. 6270, but with additional graduations on the side for direct reading. Additional graduations are Philadelphia style in eighths, with alternate eighths in solid black. "
No. 6271 is old No. 6280 $\frac{1}{2}$.

Graduated to .01 of a foot.

Vernier reads to $\frac{1}{1000}$ th foot



For type of rod see No. 6270 on page 488.

- 6272. Architects' and Builders' Rod**, $5\frac{1}{2}$ ft., extending to 10 feet, with plain target. "
No. 6272 is old No. 6281.

KEUFFEL & ESSER CO. NEW YORK

K & E LEVELING AND STADIA RODS.

REG. U. S. PAT. OFF.



6270

Architect's.
Plain Target

Description, page 487.



6274.

Metagrad
LO-VAR Rod.

Description, page 489.



6276.

Folding Rod.

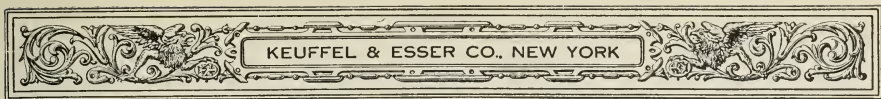
Description, page 489.



6278.

Long Distance
Stadia

Description, page 491.



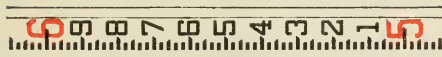
K & E METAGRAD LO-VAR ROD.

REG. U. S. PAT. OFF.

REG. U. S. PAT. OFF.

One piece, hard maple, tapering pinewood rib, Philadelphia pattern graduations on **LO-VAR** (metal) strip. **LO-VAR** has a coefficient of expansion of about .0000015 per degree Centigrade (about .00000083 per degree Fahrenheit), as against .0000116 per degree Centigrade (about .00000645 per degree Fahrenheit) for ordinary steel. The **LO-VAR** strip is held rigidly at the bottom of the rod, and is kept properly taut by means of a tension spring near the top. The combination of **LO-VAR** and the Metagrad principle makes this rod suitable for precision leveling. Tapered steel foot piece. Width of face $1\frac{1}{8}$ in. Cannot be furnished with target.

Graduated to .01 of a foot.



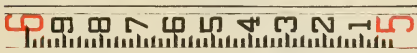
For pattern of rod see No. 6274 on page 488.

6274. Metagrad **LO-VAR** Rod, 12 feet. each
No. 6274 is old No. N6286.

FOLDING ROD


Two pieces, pinewood, tapering rib, strong brass hinge with brace, Philadelphia pattern graduations. Often used for Stadia surveys where long sights are not required. Folds into a compact form easily transported. Width of face $1\frac{1}{8}$ in. Cannot be furnished with target.

Graduated to .01 of a foot.



For pattern of rod see No. 6276 on page 488.

6276. Folding Rod, 12 ft. folding to 6 ft. each
No. 6276 is old No. 6287B.


 KEUFFEL & ESSER CO., NEW YORK

GRADUATED METAGRAD FACING STRIPS.

REG. U. S. PAT. OFF.

The graduated facing strips described below make repairs to Metagrad Philadelphia Leveling Rods, both rapid and easy. By following the simple directions furnished with the facing strips, anyone may regraduate a K & E Metagrad Philadelphia Rod with no other equipment than a hammer and screw-driver. These facings comprise one of the elements of U. S. Patent No. 1,957,838 and other patents pending. They are sold only for use on K & E Co's Metagrad Rods and in accepting them the purchaser binds himself to use them only on K & E Co's Metagrad Rods.

Graduated Metagrad Facing Strips Complete with all necessary fastenings for Metagrad Rods, with Directions.

6277-6.	Per set of 4 strips, for Rod No. 6254	. . . . .	set
6277-7.	" " " " " " " " 6256	. . . . .	"
6277-9.	" " " " " " " " 6262	. . . . .	"
6277-10.	" " " " " " " " 6263-5	. . . . .	"
6277-11.	" " " " " " " " 6263-9	. . . . .	"

Nos. 6277-6 to -11 are old Nos. 6260-6C to -11C.

Graduated Metagrad Facing Strips for short or closed rod, consisting of front face of lower rod section and the short strip on the upper rod section, with Directions.

6277-6F.	Per set of 2 strips for closed Rod No. 6254	. .	each
6277-7F.	" " " " " " " " 6256	. .	"
6277-9F.	" " " " " " " " 6262	. .	"
6277-10F.	" " " " " " " " 6263-5	. .	"
6277-11F.	" " " " " " " " 6263-9	. .	"

Nos. 6277-6F to -11F are old Nos. 6260-6 to -11.



K & E SELF-READING STADIA RODS.
REG. U. S. PAT. OFF.
FOR LONG DISTANCE WORK.



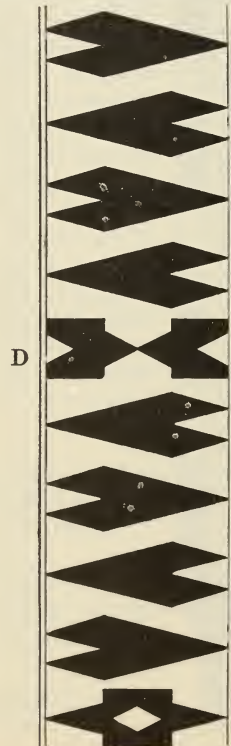
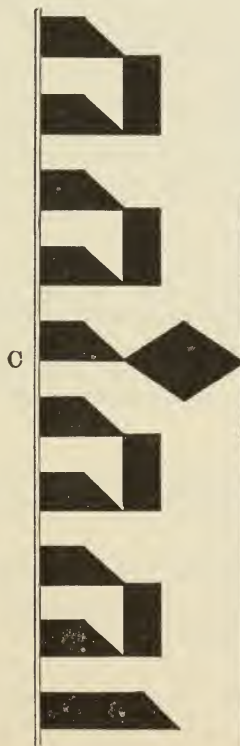
No. 6278. Graduated to 0.1 of a foot
 For pattern of rod see No. 6278 on page 488.

6278. Long Distance Stadia Rod, Pinewood, self-reading, with strong bronze hinge, 14 ft., 2 fold, folding to 7 ft.; Width of face 3 in., Weight 12 lb. each
 No. 6278 is old No. 6275.

6278-5. Long Distance Stadia Rod, self reading, with strong bronze hinges, 5 meters, 4 fold, folding to 1.25 meters. Alternate meters red and black numbers inverted. Smallest division 2 cm. Width of face 3 in. "
 No. 6278-5 is old No. 6275-5.

SPECIAL STADIA RODS TO ORDER.

In addition to the pattern shown on Rod No. 6278, which is regularly carried in stock, we are prepared to make Stadia Rods of special designs. Patterns B, C and D, shown below, are a few samples of the many special Stadia Rods which we have made. Prices will be quoted upon application.



KEUFFEL & ESSER CO., NEW YORK

K & E PRECISE LEVELING ROD

REG. U. S. PAT. OFF.

U. S. Coast and Geodetic Survey Model

The **Precise Leveling Rod** is made in accordance with the specifications of the U. S. Coast and Geodetic Survey. It is 3.25 meters in length and consists of (1) a graduated strip of **LO-VAR*** metal, rigidly attached to (2) a cast steel foot piece, the latter being fastened to (3) a wooden rod which supports the strip.

1. The **LO-VAR*** (nickel-iron alloy) strip has a very low coefficient of expansion. The graduations, in two rows, form alternate squares of black and white on this strip. The squares are one centimeter. The strip is securely fastened at one end to the cast steel foot piece, and is kept taut by means of a stiff spring set into a recess in the back of the rod and bearing against a small brass angle plate attached to the top of the strip.

2. The foot piece is case hardened, and is ground flat and normal to the surface against which the wooden backing is fastened.

3. The wooden backing, about 3 in. wide, is made of well seasoned, straight-grained white pine, free from knots and all defects. It is rigidly bolted to the foot piece. A shallow groove, slightly wider than the **LO-VAR*** strip, is routed out through the entire length of the face, and deep enough so that the strip is free to move underneath the brass washers recessed to set back flush with the face. The front face, on either side of the strip, is painted alternately black and white in graduations one decimeter long, properly numbered. The rear face is divided to feet and tenths by suitably designed graduations, numbered at every foot. A handle for convenience in carrying is attached to the back near the center of gravity. A fine thermometer is set in a recess in the back, with the bulb resting against the rear face of the **LO-VAR*** strip.

6279. Precise Leveling Rod complete as described above, with circular spirit level. each
No. 6279 is old No. 6289.

In **Precise Leveling** these rods are used in pairs.

6279C. Shipping Case for one pair (2) **Precise Leveling Rods**. "
No. 6279C is old No. 6289C.

* REG. U. S. PAT. OFF.



Front



Rear



K & E
REG. U. S. PAT. OFF.

FLEXIBLE OR POCKET LEVELING RODS.

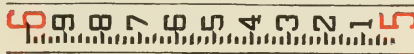
These Rods are made of prepared, waterproof, woven tape of great strength, graduated like self-reading rods. For use they are fastened to a straight board with thumb tacks. When rolled up they are easily carried in the pocket. They are put up in neat boxes.



For type of rod
see illustration
at left.

6282-10. Flexible Rod, 3 in. wide, 10 ft., div. 10ths and 100ths ft. each
No. 6282-10 is old No. 6331.

6282-12. Flexible Rod, 3 in. wide, 12 ft., div. 10ths and 100ths ft. "
No. 6282-12 is old No. 6332.



For type of rod
see illustration
at left.

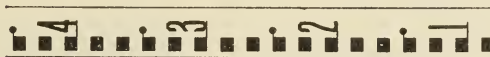
6283-10. Flexible Rod, 1½ in. wide, 10 ft., div. 10ths and 100ths ft. "
No. 6283-10 is old No. 6333.

6283-12. Flexible Rod, 1½ in. wide, 12 ft., div. 10ths and 100ths ft. "
No. 6283-12 is old No. 6334.



For type of rod
see illustration
at left.

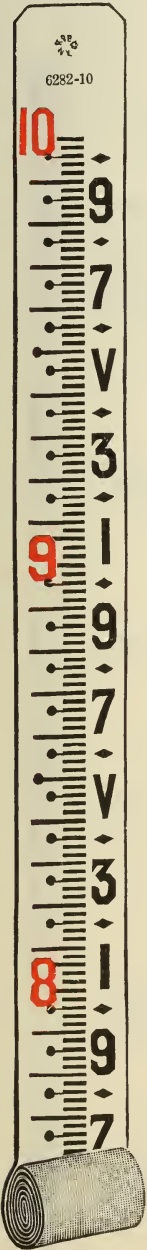
6284. Flexible Rod, 1½ in. wide, 6 ft., div. ft., inches and ¼ in. "
No. 6284 is old No. 6335S.



For type of rod
see illustration
at left.

6285. Flexible Rod, 1½ in. wide, metric, 3.5 meters, div. to centimeters. "
No. 6285 is old No. N6340.

6288. Flexible Rod, 3 in. wide, metric, 5 meters, div. to centimeters. "
No. 6288 is old No. 6341.



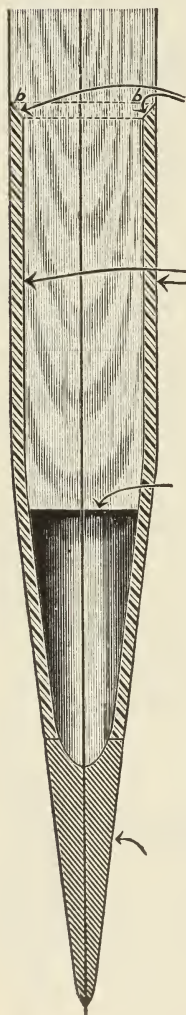
No. 6282-10.

KEUFFEL & ESSER CO., NEW YORK

K & E RANGING POLES.

REG. U. S. PAT. OFF.

WOOD



This shoe is counter-bored, so that the reduction in dia. of the wooden pole is accomplished with the least possible reduction in strength.

Steel, $2\frac{1}{2}$ times as strong as cast iron, permitting the use of only one third as much metal as a cast iron point.

In this type the wooden pole goes to here, giving a long connection between the pole and shoe.

Steel shoe, with hardened point, light in weight, and balancing well with wooden pole

Hardened steel point shaped so as to give the least possible resistance to enter into the ground, and one that is easily manipulated by the rodman.

INVINCIBLE

TRADE MARK

STEEL

INVINCIBLE Steel Ranging Pole—a longitudinally corrugated seamless steel tube—weighs only a trifle more than the usual wooden ranging poles of equal length. The advantages of the steel pole—immunity to warping and twisting—are retained by the INVINCIBLE.

The corrugations reduce glare and make for easier and more accurate bisection of the pole by the transitman.

The color within the corrugations remains intact and visible after prolonged use.

The “handiness” and balance of the INVINCIBLE Steel Ranging Pole is appreciated by every field man who uses it.

The socket joints of the sectional INVINCIBLE Ranging Poles are so designed that they will not loosen under vibration and other stresses resulting from field service.

The shoe is practically integral with the shaft—an insurance against breaking off.





K & E RANGING POLES

REG. U. S. PAT. OFF.

See illustrations on page 496.

METAL

- N6290. INVINCIBLE** TRADE MARK Steel Ranging Poles, longitudinally corrugated seamless steel tubing, enameled red and white alternately every foot, 6 8 feet
each

See description, page 494.

- N6290S. INVINCIBLE** TRADE MARK Steel Ranging Poles, sectional, longitudinally corrugated seamless steel tubing, in two sections, enameled red and white alternately every foot, in canvas case, 8 feet
each

- 6291. Steel Ranging Poles**, hexagonal (solid), $\frac{1}{2}$ in., thick, painted red and white alternately every foot, 6 8 feet
each

WOOD (straight-grained white pine), shoes with forged steel points as illustrated and described on page 494.

- 6292. Ranging Poles** of best seasoned wood, round, painted red and white alternately every foot, 8 feet
each

- 6293S. Ranging Poles**, sectional, reinforced, of best seasoned wood, octagonal, tapered, in two sections, painted red and white alternately every foot, 8 10 feet
each

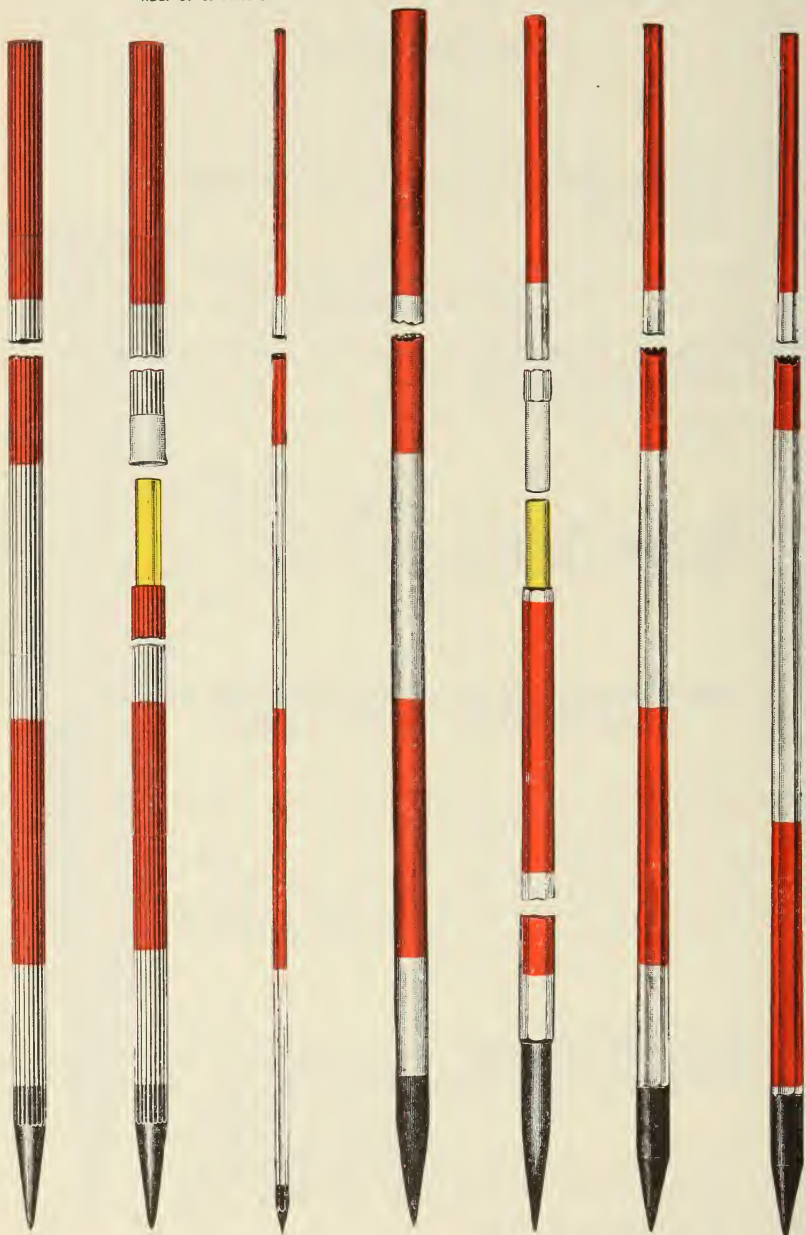
- 6293. Ranging Poles**, of best seasoned wood, octagonal, tapered, painted red and white alternately every foot, 6 8 10 feet
each

- 6295. Ranging Poles**, metric, best seasoned wood, octagonal, tapered, painted red and white alternately every half meter, 2 2 $\frac{1}{2}$ 3 meters
each

KEUFFEL & ESSER CO., NEW YORK

K & E RANGING POLES.

REG. U. S. PAT. OFF.



N6290.

N6290S.

6291.

6292.

6293S.

6293.

6295.

See descriptions page 495.



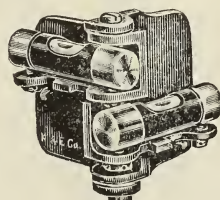
K & E ROD LEVELS

REG. U. S. PAT. OFF.



No. 6299

Illustration about $\frac{1}{2}$ size.



6300.

- 6299. Rod Level**, brass, circular spirit level. each
6300. Rod Level, brass, folding, 2 spirit levels. “

Rod Levels are used for determining whether the rod is held perpendicular.

In No. 6299 the long angle plate insures proper contact if held to the rod; it may also be attached to the rod by means of a round-head screw for which there is a keyhole slot in the plate.

No. 6300 may be attached to the rod by means of a rubber band, for which purpose it is provided with two folding hooks.

CANVAS COVERS.

FOR RODS AND POLES.

6302-A.	Canvas Cover for rod	No.	6240	each
-B.	“ “ “ “	“	6241	“
-D.	“ “ “ rods	Nos.	6254, 6254C, 6256, 6256C	“
-F.	“ “ “ “	“	6258C,	“
-G.	“ “ “ rods	Nos.	6262, 6262C	“
-J.	“ “ “ “	“	6263-5	“
-K.	“ “ “ “	“	6263-9	“
-L.	“ “ “ “	“	6268C	“
-M.	“ “ “ “	“	6269C-12	“
-P.	“ “ “ “	“	6269C-15	“
-S.	“ “ “ “	“	6270, 6271, 6272	“
6303-A.	Canvas Cover for pole	No.	N6290-6 ft.	each
-B.	“ “ “ “	“	N6290-8 ft.	“
-D.	“ “ “ “	“	6290S-8 ft.	“
-F.	“ “ “ “	“	6293-6 ft.	“
-G.	“ “ “ “	“	6293-8 ft.	“
-H.	“ “ “ “	“	6293-10 ft.	“
-K.	“ “ “ “	“	6293S-8 ft.	“
-L.	“ “ “ “	“	6293S-10 ft.	“

These covers are of heavy canvas, well made, to protect the rod or pole. In ordering these covers, please state for which catalogue number of rod or pole, and give length of pole.



K & E
REG. U. S. PAT. OFF.

PLUMB BOBS



No. N 6481
6 oz.

N 6481
18 oz.

6482
16 oz.

6482
12 oz.

N6481. 6 oz. Fine Brass Plumb Bob, with replaceable hardened blued steel point, screw cap, each

8 oz.	"	"	"	"	"	"
12 oz.	"	"	"	"	"	"
14 oz.	"	"	"	"	"	"
16 oz.	"	"	"	"	"	"
18 oz.	"	"	"	"	"	"
24 oz.	"	"	"	"	"	"
32 oz.	"	"	"	"	"	"

N6481P. Hardened blued steel point with screw thread for No. N6481 "

6482. 4 oz. Plain Brass Plumb Bob, with replaceable steel point, screw cap, "

6 oz.	"	"	"	"	"	"
8 oz.	"	"	"	"	"	"
10 oz.	"	"	"	"	"	"
12 oz.	"	"	"	"	"	"
14 oz.	"	"	"	"	"	"
16 oz.	"	"	"	"	"	"
18 oz.	"	"	"	"	"	"
24 oz.	"	"	"	"	"	"

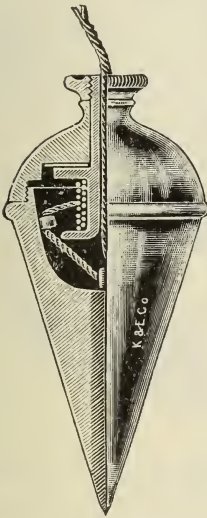
No. 6482 is old No. N6491.

6482P. Steel point with screw thread for No. 6482 "

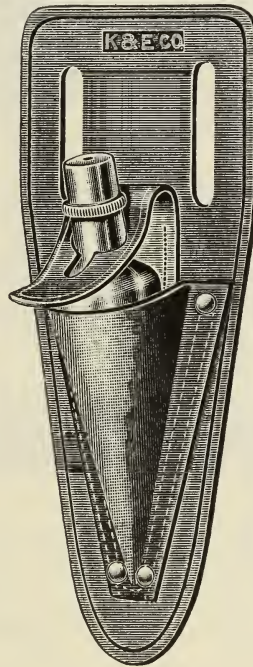


K & E
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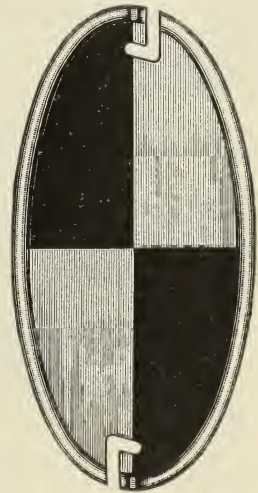
PLUMB BOBS



No. N 6487



No. N6491 $\frac{1}{2}$.



No. 6489

- N6487-** Fine Brass Plumb Bob, with reel inside, on which the line is wound and held by friction at any point of its length, about 10 oz. each
- N6488.** Plain Iron Plumb Bob, about 5 oz. “

SHEATHS, TARGET AND CORD.

- 6489.** Plumb Bob Cord Target, aluminum, oval form, reinforced edge, 2×4 in. axes, face enameled in quadrants, alternately red and natural bright aluminum, weight about 1 oz. Can be carried in the pocket. Especially suitable for tunnel and mine work each
- 6490.** Plumb Bob Cord, best linen, thin, medium or thick. . . per yard
No. 6490 is old No. 6496.
- 6490 $\frac{1}{2}$.** Plumb Bob Cord, best braided silk “ “
No. 6490 $\frac{1}{2}$ is old No. 6497.
- N6491 $\frac{1}{2}$ A.** Sewed Leather Sheath, sewed and riveted to heavy leather plate, with slots to take belt, and with slotted strap to pass over neck of plumb bob to prevent falling out, for Plumb Bobs weighing 4 to 8 oz. each
- N6491 $\frac{1}{2}$ B.** Sewed Leather Sheath, like No. N6491 $\frac{1}{2}$ A, but for Plumb Bobs weighing 12 to 14 oz. “
- N6491 $\frac{1}{2}$ C.** Sewed Leather Sheath, like No. N6491 $\frac{1}{2}$ A, but for Plumb Bobs weighing 16 to 24 oz. “

KEUFFEL & ESSER CO., NEW YORK

STAKE TACKS AND SPADS.



No. 6494.



No. 6498.

6494.	Stake Tacks, galvanized,	tin box of 50
6495.	do. do. "	" " 100
6495-1.	do. do. "	1 lb.
6495-5.	do. do. "	5 lb.

Each tack has an indentation in the surface of the head, so that the plumb bob, if suspended over it, exactly indicates location.

6498.	Surveying Spads, Montgomery's, nickelplated steel, $2\frac{1}{8}$ in., for	
	suspending plumb bob from timbers in mines;	tin box of 50
6498M.	do. do. do. in bulk,	per 1000
6499.	do. do. do. but $1\frac{1}{2}$ in.	tin box of 50.
6499M.	do. do. do. in bulk,	per 1000
6500.	Surveying Spads, Montgomery's, stainless steel; $2\frac{1}{8}$ in.	tin box of 25
6500M.	do. do. do. do. do. in bulk,	per 1000

ARROWS.



No. 6509.



6510.



6520

6509-1.	Steel Arrows, $\frac{1}{4}$ in. dia., enameled alternately red and white, 15 in., set of 11	
6509-2.	do. do. $\frac{3}{8}$ " " do. do. do. 14 " " " "	
6509-4.	do. do. $\frac{5}{8}$ " " do. do. do. 12 " " " "	

Nos. 6509-1 to 4 are old Nos. 7809-1 to 4.

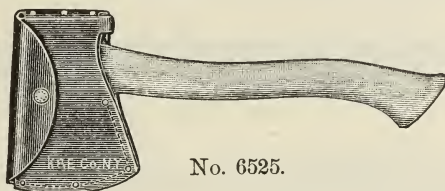
6510.	Steel Arrows, $\frac{3}{16}$ in. dia., nickelplated, 14 in.,	set of 11
	No. 6510 is old No. 7810.	

6515.	Leather Quiver with belt loop for set of 11 arrows	each
	When ordering No. 6515 state for which catalogue number of arrows.	
	No. 6515 is old No. N7820.	

6520.	Spring Steel Carrying Ring for arrows	"
	No. 6520 is old No. 7825.	



SURVEYOR'S HATCHET.



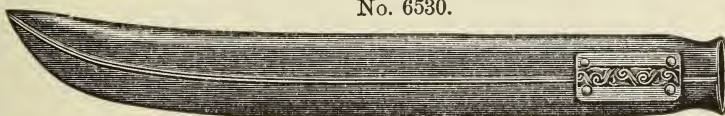
No. 6525.

- 6525. Surveyor's Hatchet**, 14 in. long over-all, blade $5\frac{1}{2}$ in. long, weight $1\frac{3}{4}$ lbs., tough handle, with leather sheath with slots to take belt..... each

SURVEYOR'S MACHETE.



No. 6530.



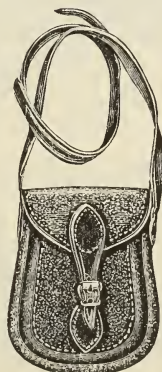
No. 6530S.

- 6530. Surveyor's Machete or Bush Knife**, 27 in. long over all, blade $21\frac{1}{4}$ in. long, horn handle $5\frac{1}{2}$ in. long, weight $1\frac{1}{2}$ lbs. each
6530S. Sewed Leather Sheath, with belt loop, for No. 6530 “

SURVEYOR'S LEATHER BAGS.

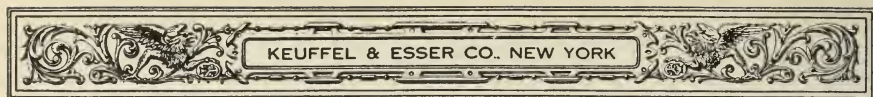


No. 6540.



No. 6542.

- 6540. Surveyor's Bag**, heavy sewed leather, natural tan color, heavy shoulder strap. Tabs for closing buckle and those for carrying strap rivetted on. Closing buckle and rings for shoulder strap brass. Two pockets. About 13 in. long \times 11 in. deep \times 2 in. wide over-all. each
 No. 6540 is old No. 7090.
6542. Surveyor's Bag, as described under No. 6540, but about $7\frac{1}{2}$ in. long \times $8\frac{1}{2}$ deep \times 2 in. wide. “
 No. 6542 is old No. 7092.



SPYGLASSES.



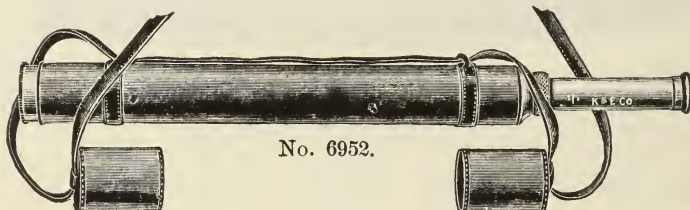
No. 6949

6949. Spyglass, $1\frac{1}{4}$ inch achromatic Object Glass, magnifying power $12\frac{1}{2}$ diameters, one draw tube; length closed about 17 in.; extended 21 in. Body enameled leather color each



No. 6950.

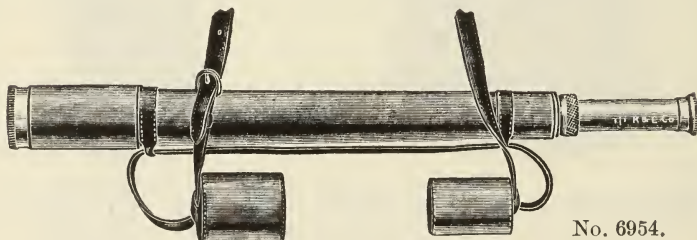
6950. Spyglass, U. S. Navy Pattern, $1\frac{1}{4}$ in. achromatic Object Glass, magnifying power $12\frac{1}{2}$ diameters, one draw tube, length closed about 17 in.; extended 21 in. Body leather covered; shoulder strap each



No. 6952.

6952. Spyglass, U. S. Navy Pattern, $1\frac{1}{4}$ in. achromatic Object Glass, magnifying power $13\frac{1}{2}$ diameters, one draw tube with focusing device (knurled ring), length closed about 22 in.; extended 26 in. Body leather covered; leather caps and shoulder strap each

6953. Spyglass, U. S. Navy Pattern, like No. 6952, but with power of 20 diameters “

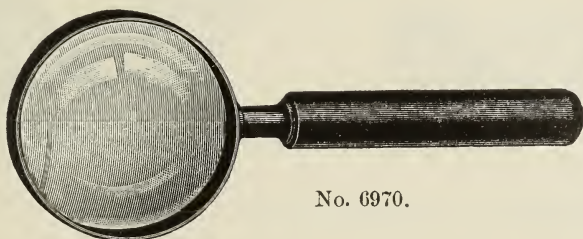


No. 6954.

6954. Spyglass, U. S. Navy Pattern, $2\frac{1}{8}$ in., achromatic Object Glass, magnifying power 30 diameters, one draw tube with focusing device (knurled ring). Length closed about 24 in.; extended 28 in. Body leather covered; leather caps and shoulder strap, each



MAGNIFYING GLASSES. READING GLASSES.

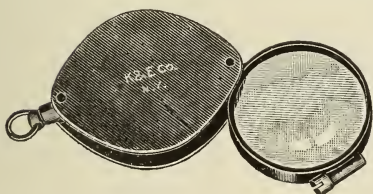


No. 6970.

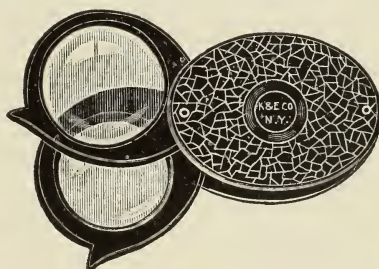
6970. Reading Glasses, Nickel Silver Rim, Black Finish, Black Wood Handle, high grade clear lens

	A	B	C	D	E
	$2\frac{1}{8}$	$2\frac{3}{4}$	$3\frac{3}{8}$	$3\frac{1}{4}$	$4\frac{1}{2}$ in.
each					

POCKET MAGNIFYING GLASSES



No. 6980.



No. 6992-3.

MOUNTED IN METAL.

6980. Round, bronzed frame, 1 lens, 1 in. each

This glass has a large, flat field and good magnifying power; and is well adapted for reading graduations on Surveying Instruments. The mountings are non-magnetic.

6990A. Oval Pattern, dull nickelplated brass frame, 1 lens, 1 in. dia, mag. 5X each

6990B. do. do. do. do. $1\frac{1}{4}$ " " 4X "

6990C. do. do. do. do. $1\frac{1}{2}$ " " 3X "

The lenses of these glasses are of a quality superior to those furnished with 6980 and 6992.

MOUNTED IN RUBBER.

6992-1. Oval Pattern, 1 lens, 1 in. diameter each

6992-2. do. 1 " $1\frac{1}{2}$ " " "

6992-3. do. 2 lenses, 1 " " "

6992-4. do. 2 " $1\frac{1}{2}$ " " "

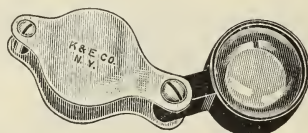
Nos. 6992-1 to -4 are old Nos. 7000 to 7003.



ACHROMATIC POCKET MAGNIFIERS.



No. 6994-3



No. 6994-5

6994-2. Pocket Magnifier, achromatic, nickelplated brass frame, lens
 $\frac{5}{8}$ in., magnifying power about 8 diameters; a very
 fine glass with good definition, for examining ore,
 etc.; in leatheret covered case each
 No. 6994-2 is old No. N7022.

6994-3. Pocket Magnifier, achromatic, extra powerful, in bronzed brass
 frame, lens about $\frac{3}{4}$ in., magnifying power about 15
 diameters, in leatheret covered case “
 No. 6994-3 is old No. N7023.

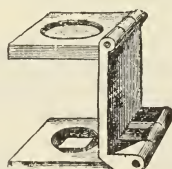
6994-4. Pocket Magnifier, aplanatic, extra powerful; nickelplated
 brass frame, lens about $\frac{9}{16}$ in. dia., magnifying power
 about 12 diameters “
 No. 6994-4 is old No. N 7025.

6994-5. Pocket Magnifier, aplanatic, nickelplated brass frame; lens about
 $\frac{3}{4}$ in. dia., magnifying power about 10 diameters “
 No. 6994-5 is old No. N7026.

6994-6. Pocket Magnifier like No., 6994-5 but lens about $\frac{1}{2}$ in. dia., and
 magnifying power about 8 diameters “
 No. 6994-6 is old No. N7027.

THREAD COUNTERS.

(LINEN PROVERS.)



No. 6996-1.

6996-1. Thread Counter, folding brass frame, $\frac{1}{4}$ in. field each
 -2. “ “ “ “ “ $\frac{1}{2}$ “ “ “
 -3. “ “ “ “ “ 1 “ “ “

Nos. 6996-1 to -3 are old Nos. 7035 to 7037.



K & E

MEASURING TAPES



KEUFFEL & ESSER CO., NEW YORK

K & E

REG. U. S. PAT. OFF.

MEASURING TAPES.

These tapes, which are made in the K & E Factory in Hoboken, are recommended for their superiority in *design, material, workmanship, and accuracy*. They are graduated according to the U. S. Standard of the National Bureau of Standards at Washington, D. C.

SUBDIVISIONS.

U. S. STANDARD

Steel Tapes in feet, inches and eighths have the foot graduated to inches ($\frac{1}{12}$ foot) and each inch to eighths, making the ultimate graduation $\frac{1}{8}$ inch, except the Liliput and Midget Tapes, which are graduated to $\frac{1}{16}$ inch.

Steel Tapes in feet, tenths and hundredths of a foot, have the foot graduated into 10 parts and each $\frac{1}{10}$ again into 10 parts, making the ultimate graduation $\frac{1}{100}$ foot.

Woven Tapes in feet, inches and $\frac{1}{2}$ inches, have the foot graduated to inches ($\frac{1}{12}$ foot) and the inches to halves, making the ultimate graduation $\frac{1}{2}$ inch, except the Piccolo Tape, which is graduated to $\frac{1}{4}$ inch.

Woven Tapes in feet, tenths and half tenths of a foot have the foot graduated into 10 parts and each $\frac{1}{10}$ into halves, making the ultimate graduation half tenths of a foot, except the Piccolo Tape, which is graduated to $\frac{1}{10}$ and $\frac{1}{100}$ foot.

Spring Winding Pocket Tapes: **Tip Top WYTEFACE Tapes** Nos. W7397 T-3 to -6 are graduated to inches in 16ths, Nos. W7397TD-3 to -6 are graduated to inches in 16ths on one side, and to 10ths of feet in 100ths on the other side; Nos. W7397TM-3 to -6 are graduated to inches in 16ths on one side, and to millimeters on the other side.

Spring Winding Pocket Tapes with Scale: **Tip Top WYTEFACE Tape** No. W7398A is graduated to a scale of $\frac{1}{4}$ in. to the foot on one side, and to a scale of $\frac{1}{4}$ in. to the foot on the other side; No. W7398-4 is graduated to inches in 16ths on one side, and to a scale of $\frac{1}{4}$ in. to the foot on the other side; and No. W7398-8 is graduated to inches in 16ths on one side and to a scale of $\frac{1}{8}$ in. to the foot on the other side.

METRIC.

Steel Tapes in **Metric** measure are graduated to half centimeters, the first decimeter to millimeters.

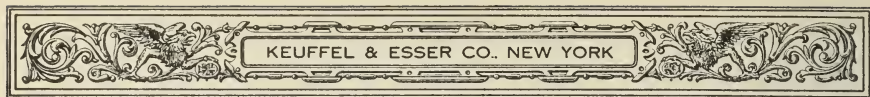
Woven Tapes in **Metric** measure are graduated to centimeters throughout.

Spring Winding Pocket Tapes in **Metric** Measure are graduated to millimeters throughout.

On all tapes in the **METRIC** measure, except Paine's pattern tapes, the measurement begins "on the line."

SELF OPENING HANDLE.

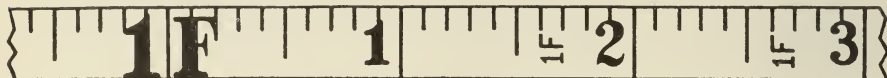
The "Illinois," "Stevens," "Midget," "Armor," "Home," "Handy" and "Okeh" Steel Tapes and the "Piccolo" and "Popular" Woven Tapes have handles which are opened by pressure on a small pin in the back of the center. The handles of the "Cornell" "Rensselaer" and "Liliput" Steel Tapes and the "Harvard" Woven Tapes are opened by direct pressure on the end of the grip.



K & E
REG. U. S. PAT. OFF.

WYTEFACE STEEL TAPES

TRADE MARK



The **K & E WYTEFACE Steel Measuring Tapes**, described in the following pages, are the result of years of research, by **K & E Co.**, to overcome some of the inherent disadvantages of the ordinary type steel tapes.

The permanent white background of the **K & E WYTEFACE Steel Measuring Tapes** makes the black graduations and numerals so legible that they can be read without eyestrain, even when they are used in very dim light.

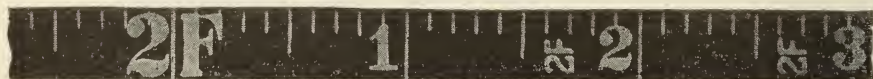
The **WYTEFACE** coating protects the steel line from corrosion, thus greatly prolonging the life of the **WYTEFACE** lines; since rust rather than wear is the usual cause of the obliteration of figures and graduation marks from the face of ordinary etched tapes.

The thickness of the **WYTEFACE** lines is not reduced by any etching process; consequently, the full temper or springiness and strength of the original line is retained. It is for this reason that **WYTEFACE** tapelines can be kinked only with difficulty. Since kinking is the usual cause of steel tape breakages, the possibility of breaking in the **WYTEFACE** steel tape lines is very greatly reduced.

The special coating used on the **WYTEFACE** lines will not crack, chip or separate from the steel, even if the tape is bent to the point of breaking.

The corrections usual to steel tapes—tension, temperature, etc.—apply with equal effect to **WYTEFACE**.

KECO Finish.



KECO finish produces a dense black background with etched steel graduations and numerals. **KECO** is as good a finish as can be given to any steel tape with a black background.

KEUFFEL & ESSER CO., NEW YORK

K & E

REG. U. S. PAT. OFF.

“READY READING” TAPES**Prevent Errors and Save Time.**

The foot numbers, which are repeated at every sub number, are placed at right angles to the sub numbers and are read *across* the tape instead of lengthwise. This arrangement facilitates reading and thus prevents errors and saves time. In making horizontal measurements greater than five feet, the tape user is “behind” his tape, so that this lateral position of the foot numbers is the most natural and convenient, for both horizontal and vertical measuring, as shown in the cuts below. Furthermore, it is much less confusing than where all numbers (foot and inch or tenth alike) are positioned longitudinally on the tape; in which case, foot numbers and sub numbers, being often duplicated, are frequently mistaken for each other.

The foot number *is repeated at every inch mark or tenth mark*, directly ahead of the sub number, throughout the entire length of the tape. This absolutely prevents mistakes in reading the tape, since there can never be the slightest doubt as to the number of *feet* measured at any point on the tape.

The great advantages of this system of numbering are instantly obvious to any one who uses a tape, and will be fully appreciated because almost everyone has made mistakes of a foot in measuring with tapes numbered in the ordinary way, with the foot figures appearing only once every twelve inches. Such mistakes are always troublesome, frequently costly and sometimes dangerous.



Much time is also saved by this system of numbering, as one need not look back to the beginning of the foot to see the foot number; since, on the contrary, it is constantly in front of the eye in close juxtaposition to every sub number.



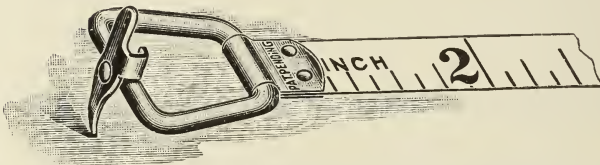


K & E
REG. U. S. PAT. OFF.
END FASTENER

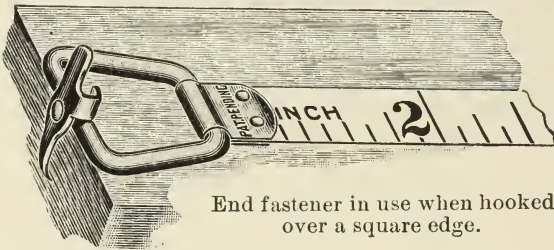
(Patented.)



Position of end fastener when not in use.



End fastener in use when pressed
into yielding material.



End fastener in use when hooked
over a square edge.

K & E STEVENS, OKEH and DARTMOUTH tapes (see 521 pages, 524 and 531) are carried with the handy device known as the **K & E End Fastener** (patented.)

The **end fastener** permits of the use of a measuring tape by one person without the aid of another. The end fastener is a part of the end ring, to which it is securely attached, and it is easily swung out of the way when not in use. The illustrations plainly show the purpose and use of the tape with the **K & E End Fastener**.

KEUFFEL & ESSER CO., NEW YORK

K & E

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FRICITION BRAKE

(Patented.)



The **K & E Friction Brake** is a simple and durable device which maintains friction between the drum and the case in which it turns with just sufficient pressure to prevent the drum from rotating under the spring of the tape alone.

The operation of the Friction Brake is extremely simple. The spring (c), attached to the inside of the drum (d), causes the shoe (a) to press outwardly through an opening in the drum against the metal eyelet of the case (b). By this arrangement friction between the drum and case is maintained regardless of any slight wear of the faces of the shoe and eyelet.

By this means both "back lash" and binding of the line within the case are eliminated; "back spinning" of the handle is prevented; time in operation is saved; and the life of the tape considerably prolonged.

The patented **K & E Friction Brake** is applied to **K & E Steel Tapes** in cases (except the Tip Top).



K & E
REG. U. S. PAT. OFF.

STEEL TAPES

WORKING TENSIONS

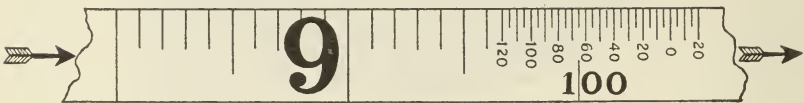
All K & E Steel Tapes are graduated to meet the requirements of the National Bureau of Standards at Washington. Those desiring an official Certificate of Comparison may send, or have us send, K & E Steel Tapes to the Bureau of Standards, where tests will be made under the conditions given on pages 10 and 11.

All K & E tapes 100 ft. long or less are graduated to require a tension of 10 lbs., and tapes longer than 100 ft. are graduated to require a tension of 20 lbs., when supported on a horizontal flat surface at 68° F. Metric tapes 30 meters long or less are graduated to require a tension of 4½ Kg., and those longer than 30 meters are graduated to require a tension of 9 Kg., when supported on a horizontal flat surface at a temperature of 20° C. The tension required for a Tape supported throughout on a horizontal flat surface is the same for any part of the tape as for the full length.

The tension required for a steel tape when supported at the ends will depend upon the unsupported length and the cross-sectional area of the tape. The value of this tension for any specific tape can be determined only by tests.

The coefficient of expansion of K & E Steel Tapes may be assumed to be 0.00000645 per degree Fahrenheit (0.0000116 per degree Centigrade).

THERMOMETER SCALE



Ending of 100 foot tape with Thermometer Scale. Actual size.

F. S. Patent Thermometer Scale on 50 or 100 foot tape.

As a means of obtaining additional accuracy and uniformity in measuring, **steel tapes with thermometer scale are recommended.** This scale is graduated to correspond to the contraction and expansion of the tape, according to the Fahrenheit thermometer for tapes graduated in feet, or the Centigrade thermometer for tapes in metric measure. It takes the place of the terminal mark of the tape and the terminal point lies at that mark of the thermometer scale which corresponds to the prevailing temperature reading at the time of taking the measurement.

This scale cannot be applied to Liliput, Midget, Home, Handy, Okeh, and Armor; nor to tapes less than one-quarter inch wide, the latter exception including the Flat Wire Tapes listed on pages 537 and 538.

KEUFFEL & ESSER CO. NEW YORK

K & E
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STEEL TAPES.

OFFICIAL CERTIFICATE OF COMPARISON.

We can furnish a Certificate of Comparison by the National Bureau of Standards at Washington for any of the K & E Steel Tapes, the graduations of which **begin on the line**. The Bureau is not prepared to test tapes supported at points more than 150 feet or 50 meters apart; nor can it test a tape at any point which is not a point at which the tape is supported.

NOTE: Any of the K & E steel tapes are furnished, upon order, with graduations beginning on the line, without extra charge. The Bureau of Standards Certificate is given only to tapes with graduations beginning on the line, where these graduations are "WYTEFACE" or etched on the line. All other tapes are eligible for a Report from the Bureau, the Report giving the data usually furnished in a Certificate, but without the official Certification.

The prices for comparing are those charged by the Bureau; and **do not include** the transportation charges to and from Washington, which are extra.

Sa.—Determination of correction to the total length of the tape when supported throughout at standard tension and at standard temperature, for each 150 feet or 50 meters or fraction thereof

NOTE—This is the regular standard test required by the Bureau of Standards; and which must be made and charged for in each case to determine whether or not the tape is entitled to the Bureau's certification. To this amount must be added the fees for any additional tests made, and for Item (Sm), if applicable, in accordance with the following schedule:—

Sb.—Determination of the correction to the total length when supported throughout at any tension other than the standard tension, for each 150 feet or 50 meters or fraction thereof.

The tension desired must be specified.

Sc.—Determination of the correction to the total length when supported at the ends only.

The Bureau is not prepared to make this test on tapes having a greater length than 150 feet or 50 meters.

Standard tension will be used unless another tension is specified.

Sd.—Determination of the correction to the total length when supported at the ends and one or more intermediate points, for each 150 feet or 50 meters or fraction thereof.

Standard tension will be used unless another tension is specified.

Se.—Determination of the correction to the length of a subinterval under the same conditions as to tension and points of support as for total length.

The points at which these measurements are made must be points at which the tape is supported. The Bureau is not prepared to test tapes supported at points more than 150 feet or 50 meters apart.

KEUFFEL & ESSER CO., NEW YORK

K & E
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STEEL TAPES

OFFICIAL CERTIFICATE OF COMPARISON. (CONTINUED)

St.—Determination of the correction to the length of a subinterval under different specified conditions as to tension and points of support from those used for the total length.

Sg.—Determination of the tension to the nearest integral half pound or quarter kilogram at which the correction to the length of an interval is most nearly zero, under a specified condition of support, for each 150 feet or 50 meters or fraction thereof.

Sh.—Determination of the correction to a subinterval at the tension at which the correction to the total length is most nearly zero, and under the conditions of support used in the test under item (Sg).

Si.*—Determination of the coefficient of expansion of a tape for each 150 feet or 50 meters, or fraction thereof.

Five-sixths of the above fee is a charge to cover the cost of cooling the tape testing laboratory. In case several tapes are tested at one time this portion is prorated. All of the tapes need not be submitted from the same source.

Sj.—Determination of Young's modulus of elasticity for each 150 feet or 50 meters or fraction thereof.

Not obtainable for "WYTEFACE" lines, for which substitute test Sn.

Sk.—Determination of the weight per foot or per meter of a tape.

Sl.—Testing spring balance accompanying tape.

Sm.—Additional charge for each tape sent without a reel, for each 150 feet or 50 meters, or fraction thereof.

Sn.—Determination of AE.

So.—Computed values.

Sp.—Testing "Lo-Var" base line tapes or wires. Prices on the above tests or their equivalents quoted on request.

Special schedule will be furnished upon request.

Sx.—Copies of certificates or reports previously issued or reissue of worn or damaged certificates or reports returned.

Sz.—For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.

* Since this test is a very expensive one, it is advisable to have it made only where a tape is to be employed for work requiring a very high degree of accuracy. For K & E Steel Tapes it is safe to assume the coefficient of expansion as 0.0000645 per degree Fahrenheit (0.0000116 per degree Centigrade).

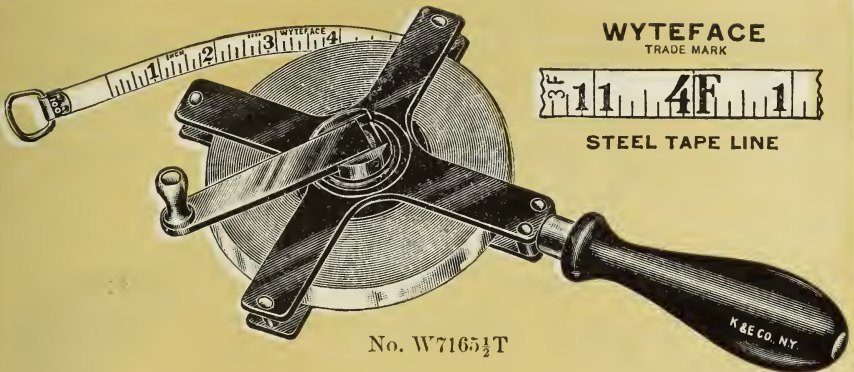
KEUFFEL & ESSER CO., NEW YORK

K & E

REG. U. S. PAT. OFF.

WYTEFACE STEEL TAPES

TRADE MARK



No. W7165 $\frac{1}{2}$ T

TEXAS WYTEFACE Steel Tapes $\frac{3}{8}$ in. wide, on aluminum frame, black hardened surface, large center with long folding handle, all mountings nickelplated and highly polished. Black finished grip. Tapes are furnished on frames with 4 arms, except the 50 feet and 15 meter lines which are furnished on frames with 2 arms. Graduations begin on the line.

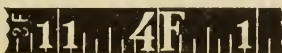
"Ready Reading" Length in feet,	50	100	150	200
Feet, inches & 8ths	No. W7162T	W7165T	W7166T	W7167T
Feet, 10ths & 100ths ft.	W7162D	W7165D	W7166D	W7167D
Length in Meters,	15	30	50	
Metric, to $\frac{1}{2}$ cm. throughout (one side only)	No. W7162M	W7165M	W7166M	
Metric, other side feet, inches & 8ths	W7162TM	W7165TM	W7166TM	

Note: On metric tapes the first decimeter is divided to millimeters.

TEXAS WYTEFACE Steel Tapes $\frac{3}{8}$ in. wide, on aluminum frame, black hardened surface, large center with lock handle, all mountings nickelplated and highly polished. Black finished grip. The 100 ft. tapes are furnished on frames with 4 arms, and the 50 ft. tapes on frames with 2 arms. Graduations begin on the line.

"Ready Reading". Length in feet	50	100
Feet, inches & 8ths	No. W7162 $\frac{1}{2}$ T	W7165 $\frac{1}{2}$ T
Feet, 10ths & 100ths ft.	W7162 $\frac{1}{2}$ D	W7165 $\frac{1}{2}$ D

For illustration of folding handle, see cut of No. W7175D, page 514.



KECO BLACK FINISH TAPES
with etched graduations will be furnished
if so ordered.

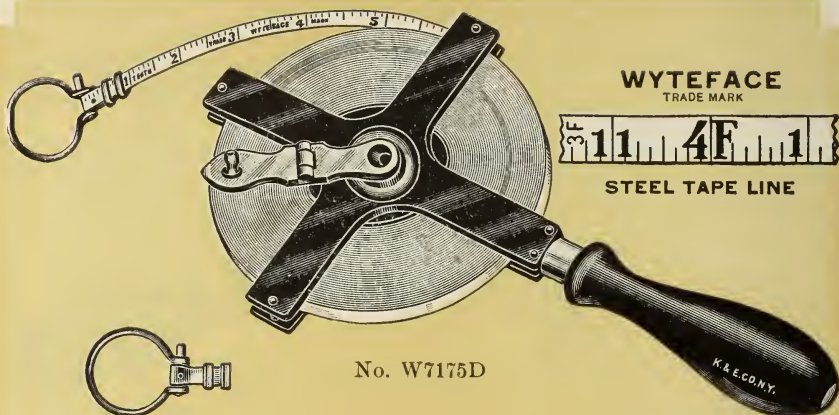


K & E

REG. U. S. PAT. OFF.

WYTEFACE STEEL TAPES

TRADE MARK



No. W7175D

WYTEFACE

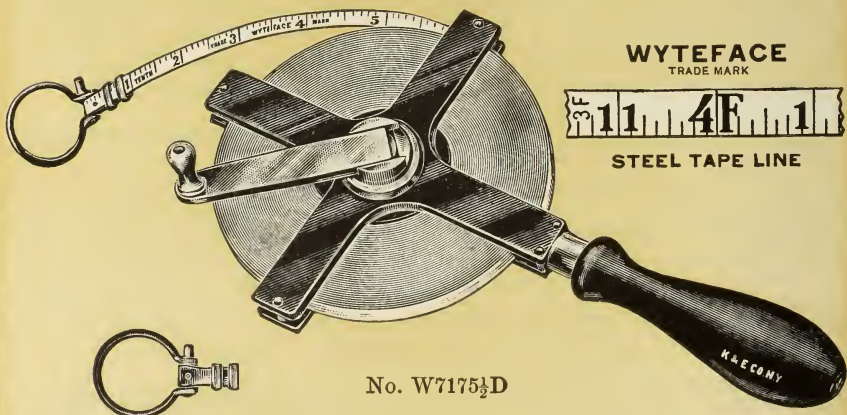
TRADE MARK



STEEL TAPE LINE

MAINE TRADE MARK WYTEFACE Steel Tapes, $\frac{1}{4}$ in. wide, Paine's Pattern, on aluminum frame, black hardened surface, large center with long folding handle, all mountings nickelplated and highly polished, two handles for tape line. Line readily detached from reel. Black finished grip. Tapes are furnished on frames with 4 arms, except the 50 ft. tapes, which are furnished with 2 arms. Graduations begin at end of line.

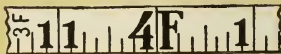
"Ready Reading" Length in feet,	50	100	150	200
Feet, inches & 8ths	No. W7172T	W7175T	W7176T	W7177T
Feet, 10ths & 100ths ft. . . .	W7172D	W7175D	W7176D	W7177D



No. W7175 $\frac{1}{2}$ D

WYTEFACE

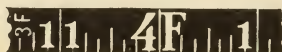
TRADE MARK



STEEL TAPE LINE

MAINE TRADE MARK WYTEFACE Steel Tapes, as described above, except that the reel is equipped with a lock handle.

"Ready Reading" Length in feet,	50	100	150	200
Feet, inches and 8ths	No. W7172 $\frac{1}{2}$ T	W7175 $\frac{1}{2}$ T	W7176 $\frac{1}{2}$ T	W7177 $\frac{1}{2}$ T
Feet, 10ths & 100ths ft.	W7172 $\frac{1}{2}$ D	W7175 $\frac{1}{2}$ D	W7176 $\frac{1}{2}$ D	W7177 $\frac{1}{2}$ D



KECO BLACK FINISH TAPES
with etched graduations will be furnished if so ordered.

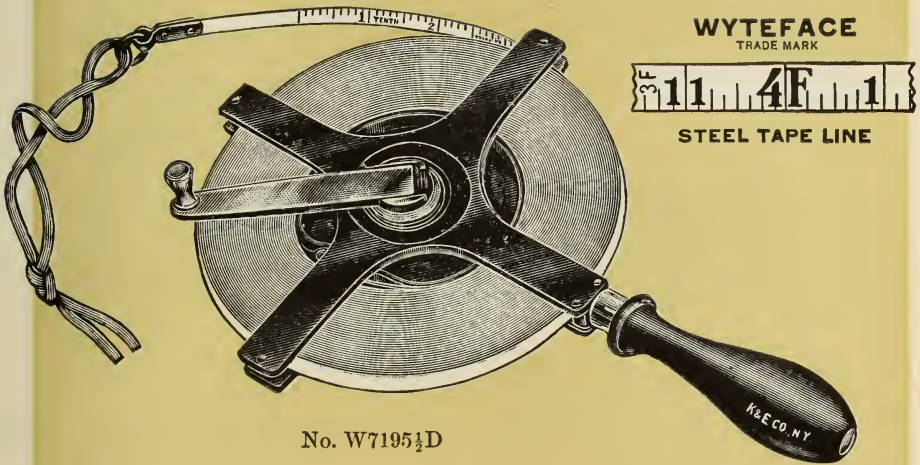


K & E

REG. U. S. PAT. OFF.

WYTEFACE STEEL TAPES

TRADE MARK

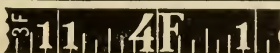


No. W7195 $\frac{1}{2}$ D

VERMONT WYTEFACE Steel Tapes, $\frac{1}{4}$ in. wide, about 50% heavier than Maine tape, on 4 arm aluminum frame, black hardened surface, large center with lock handle, all mountings nickelplated, two rawhide thongs for tape line. Line readily detached from reel. Black finished grip. Graduations begin on the line.

"Ready Reading."	Length in feet,	100	200
Feet, inches & 8ths	No. W 7195 $\frac{1}{2}$ T	W 7197 $\frac{1}{2}$ T	
Feet, 10ths & 100ths ft.	W 7195 $\frac{1}{2}$ D	W 7197 $\frac{1}{2}$ D	

Since the Vermont line is about 50% heavier than that of the Maine tapes, it is much stronger and more able to withstand hard service. The reel is correspondingly larger, more sturdy, and has a larger drum.



KECO BLACK FINISH TAPES
with etched graduations will be furnished if so ordered.

KEUFFEL & ESSER CO. NEW YORK

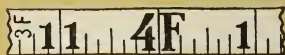
K & E

REG. U. S. PAT. OFF.

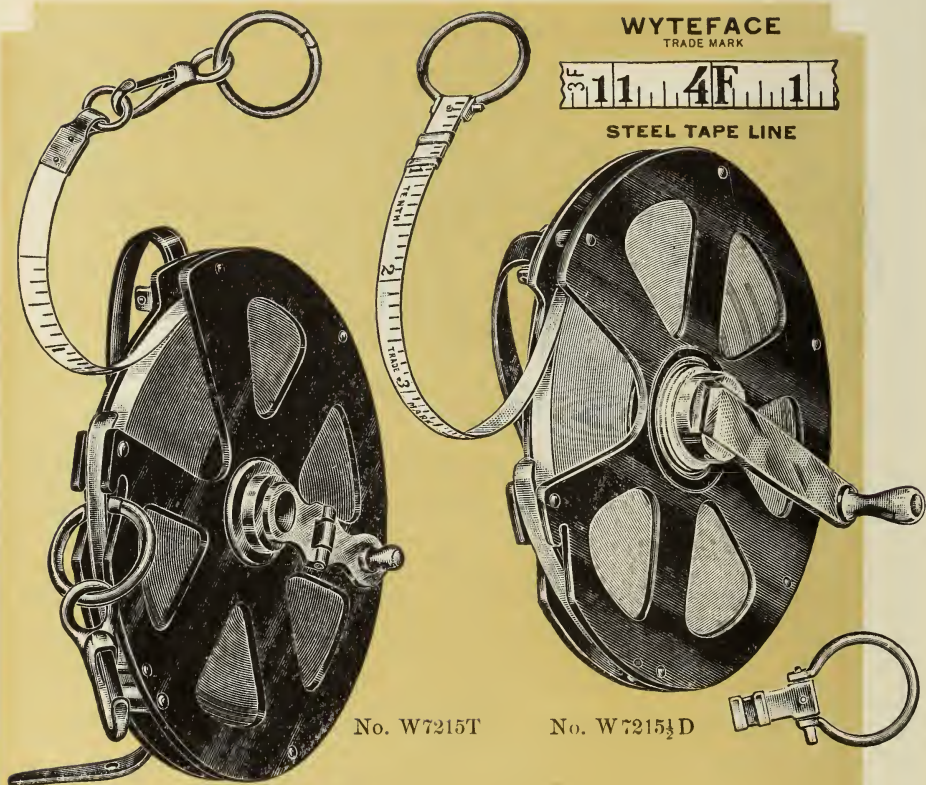
WYTEFACE STEEL TAPES

TRADE MARK

WYTEFACE
TRADE MARK



STEEL TAPE LINE



No. W7215T

No. W7215D

BERKELEY WYTEFACE Steel Tapes, $\frac{1}{4}$ in. wide, aluminum reel, black hardened surface, with leather strap, large center with long folding handle. Two handles for tape line. All mountings nickelplated. Line readily detached from reel. Graduations begin on the line.

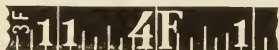
"Ready Reading"	Length in feet,	50	100	200	300
Feet, inches & 8ths	No. W7212T	W7215T	W7217T	W7218T	
Feet, 10ths & 100ths ft. . .	W7212D	W7215D	W7217D	W7218D	

BERKELEY WYTEFACE Steel Tapes, $\frac{1}{4}$ in. wide, Paine's Pattern, aluminum reel, black hardened surface, with leather strap, large center with long lock handle. Two handles for tape line. All mountings nickel plated. Line readily detached from reel. Graduations begin at end of line.

"Ready Reading"	Length in feet	50	100	200	300
Feet, inches & 8ths	No. W7212 $\frac{1}{2}$ T	W7215 $\frac{1}{2}$ T	W7217 $\frac{1}{2}$ T	W7218 $\frac{1}{2}$ T	
Feet, 10ths & 100ths ft. . .	W7212 $\frac{1}{2}$ D	W7215 $\frac{1}{2}$ D	W7217 $\frac{1}{2}$ D	W7218 $\frac{1}{2}$ D	

	Length in Meters,	30	50
Metric to $\frac{1}{2}$ cm. throughout (one side only)	No. W7215 $\frac{1}{2}$ M	W7216 $\frac{1}{2}$ M	
Metric, other side feet, inches & 8ths	W7215 $\frac{1}{2}$ TM	W7216 $\frac{1}{2}$ TM	

Note: On metric tapes the first decimeter is divided to millimeters.



KECO BLACK FINISH TAPES

with etched graduations will be furnished if so ordered.

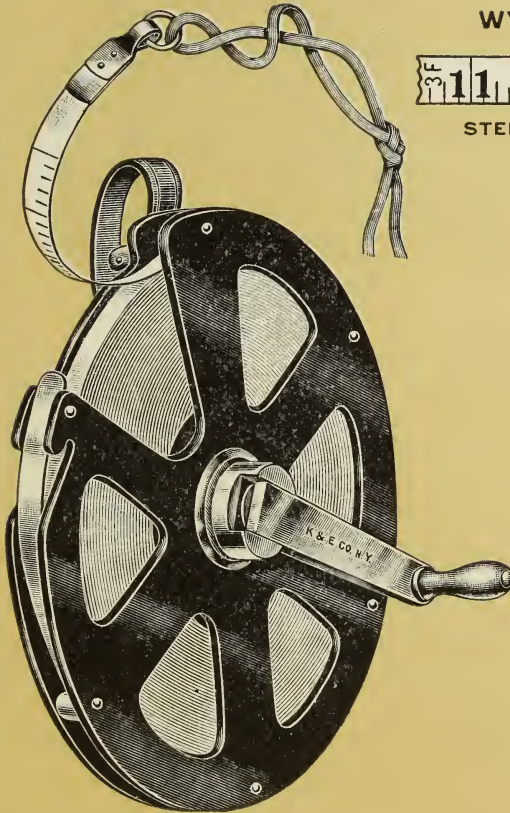
KEUFFEL & ESSER CO., NEW YORK

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REG. U. S. PAT. OFF.

WYTEFACE STEEL TAPES

TRADE MARK



WYTEFACE
TRADE MARK



STEEL TAPE LINE

No. W 7225½ D

STANFORD WYTEFACE Steel Tapes, ¼ in. wide, about 50% heavier than the Berkeley tape, aluminum reel, black hardened surface, with leather strap handle, large center with long lock handle. Two rawhide thongs for tape line. All mountings nickelplated. Line readily detached from reel. Graduations begin on the line.

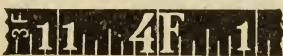
"Ready Reading."

Length in feet,

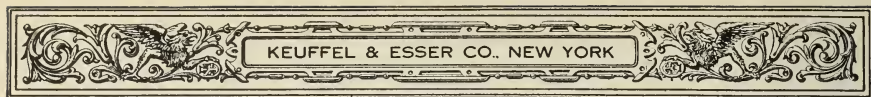
100

Feet, 10ths & 100ths ft. No. W 7225½ D

Since the Stanford line is about 50 % heavier than that of the Berkeley tapes; it is much stronger and more able to withstand hard service. The reel is correspondingly larger, more sturdy, and has a larger drum.



KECO BLACK FINISH TAPES
with etched graduations will be furnished
if so ordered.

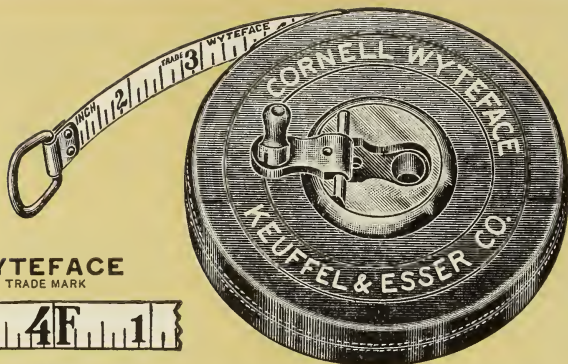


K & E

REG. U. S. PAT. OFF.

WYTEFACE STEEL TAPES.

TRADE MARK



WYTEFACE
TRADE MARK



STEEL TAPE LINE

CORNELL WYTEFACE Steel Tapes, $\frac{3}{8}$ in. wide, stout bent leather case, patent center, long swiveling flush folding handle, opened by pushing handle grip from opposite side of case. Patented friction brake. Nickel-plated mountings. Graduations begin at outside end of ring.

"Ready Reading".	Length in feet, 25	50	100
Feet, inches & 8ths	No. W7250 T	W7252 T	W7255 T
Feet, 10ths & 100ths ft. . . .	W7250 D	W7252 D	W7255 D

Graduating Cornell **WYTEFACE** Steel Tapes to 16ths inches throughout, additional charge.

STAINLESS STEEL TAPES.

NATURAL FINISH.

CORNELL Steel Tapes are also furnished with Stainless Steel lines.

TRADE MARK

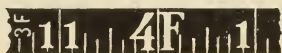
In all other respects these tapes conform to the description given under Cornell Steel Tapes above, except that they are not **WYTEFACE**.

"Ready Reading".	Length in feet, 25	50	100
Feet, inches & 8ths	No. X7250 T.	X7252 T	X7255 T
Feet, 10ths & 100ths ft. . . .	X7250 D	X7252 D	X7255 D

HOME Stainless Steel Tapes $\frac{3}{8}$ in. wide. In all other respects these tapes conform to the description given under Home Steel Tapes on page 521.

TRADE MARK

"Ready Reading".	Length in feet, 25	50	100
Feet, inches & 8ths	No. X7350 T	X7352 T	X7355 T
Feet, 10ths & 100ths ft. . . .	X7350 D	X7352 D	X7355 D



KECO BLACK FINISH TAPES
with etched graduations will be furnished if so ordered, but not on stainless steel.

KEUFFEL & ESSER CO., NEW YORK

K & E

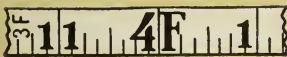
REG. U. S. PAT. OFF.

WYTEFACE STEEL TAPES.

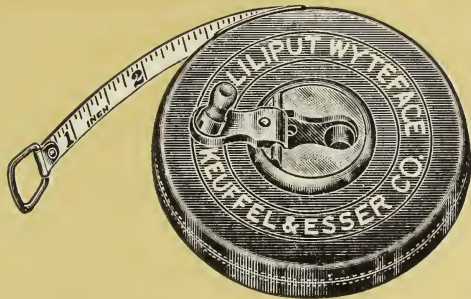
TRADE MARK

WYTEFACE

TRADE MARK



STEEL TAPE LINE



LILIPUT WYTEFACE Steel Tapes, $\frac{1}{4}$ in. wide, stout bent leather case, patent center, long swiveling flush folding handle, opened by pushing handle grip from opposite side of case. Patented friction brake. Nickel-plated mountings. Graduations begin at outside end of ring.

"Ready Reading".

Length in feet,

25

50

Feet, inches & 16ths No. W7270T

W7272T

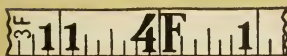
Feet, 10ths & 100ths ft. W7270D

W7272D



WYTEFACE

TRADE MARK



STEEL TAPE LINE

RENSSELAER WYTEFACE Steel Tapes, $\frac{1}{4}$ in. wide, Paine's Pattern, stout bent leather case, patent center, long swiveling flush folding handle, opened by pushing handle grip from opposite side of case. Patented friction brake. Two handles for tape line. Nickelplated mountings. Line readily detached from case. Graduations begin at end of line.

"Ready Reading".

Length in feet,

50

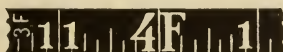
100

Feet, inches & 8ths No. W7292T

W7295T

Feet, 10ths & 100ths ft. W7292D

W7295D



KECO BLACK FINISH TAPES
with etched graduations will be furnished
if so ordered.



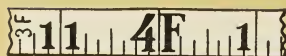
K & E
REG. U. S. PAT. OFF.

WYTEFACE STEEL TAPES.

TRADE MARK



WYTEFACE
TRADE MARK

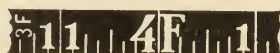


STEEL TAPE LINE

ILLINOIS WYTEFACE Steel Tapes, $\frac{1}{4}$ in. wide, Paine's Pattern, stout bent black leather case, large center with long folding self-opening handle. Patented friction brake. Two handles for tape line. Chromium-plated mountings. Line readily detached from case. Graduations begin at end of line.

"Ready Reading".	Length in feet,	50	100
Feet, inches & 8ths	No. W 7302 T	W 7305 T	
Feet, 10ths & 100ths ft.	W 7302 D	W 7305 D	
	Length in Meters,	15	30
Metric, to $\frac{1}{2}$ cm. throughout (one side only) . .	No. W 7302 M	W 7305 M	
Metric, other side feet, inches & 8ths . .	W 7302 TM	W 7305 TM	

Note: On Metric tapes the first decimeter is divided to millimeters.



KECO BLACK FINISH TAPES
with etched graduations and brown leather case will be furnished if so ordered.

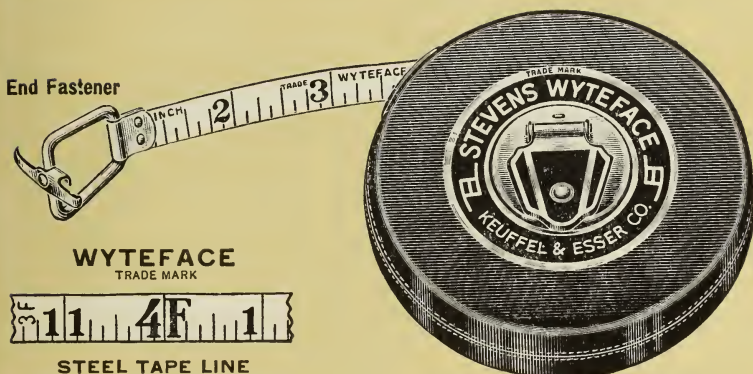


K & E

REG. U. S. PAT. OFF.

WYTEFACE STEEL TAPES.

TRADE MARK



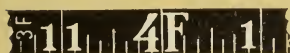
No. W7352 P.

STEVENS WYTEFACE Steel Tapes, $\frac{3}{8}$ in. wide, stout bent black leather case, large center, long folding self-opening handle. Patented friction brake. Chromium-plated mountings. Graduations begin at outside end of ring.

"Ready Reading".	Length in feet,	25	50	100
Feet, inches & 8ths	No.	W 7350 T	W 7352 T	W 7355 T
Feet, inches & 8ths with K & E End Fastener		W 7350 P	W 7352 P	W 7355 P
Feet, 10ths & 100ths ft.		W 7350 D	W 7352 D	W 7355 D

	Length in Meters,	15	30
Metric to $\frac{1}{2}$ cm. throughout (one side only)	No.	W 7352 M	W 7355 M
Metric, other side feet, inches & 8ths . . .		W 7352 TM	W 7355 TM

Note: The graduations of metric tapes begin on the line; and the first decimeter is divided to millimeters.



KECO BLACK FINISH TAPES, $\frac{3}{8}$ in. wide, with etched graduations and brown leather case embossed "HOME"* will be furnished if so ordered.

HOME tapes with KECO finish and lines $\frac{1}{2}$ in. wide can be furnished to order at the prices specified in the Price List.

For Home Stainless Steel Tapes see Nos. X7350 to X7355, page 518.



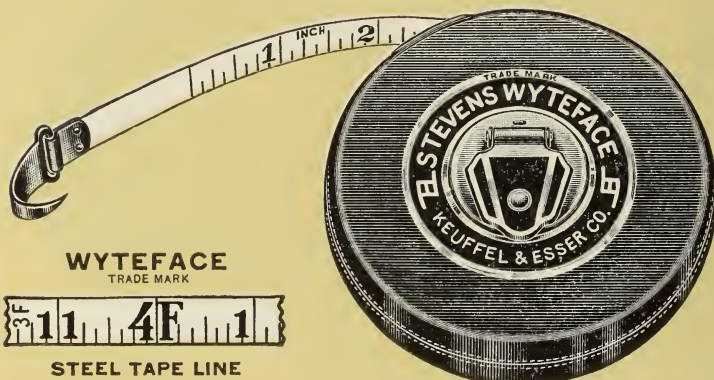
K & E WYTEFACE STEEL TAPES.

REG. U. S. PAT. OFF.

TRADE MARK

DIAMETER (TREE) TAPES

(FORESTER'S TAPES)

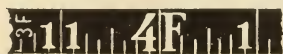


W7356. STEVENS WYTEFACE ^{TRADE MARK} Steel Diameter (Tree) Tape, $\frac{3}{8}$ in. wide, 20 feet; one side in feet, 10ths and 100ths of a foot, other side graduated to give diameter in inches and 10ths of an inch consecutively up to 76 inches direct from a circumference measurement; stout bent black leather case, long folding self-opening handle. **Patented friction brake.** Chromium-plated mountings. Hinged end hook for fastening to tree, which fits in orifice in edge of case when not in use. Graduations begin on the line.

W7357. STEVENS WYTEFACE ^{TRADE MARK} Steel Diameter (Tree) Tape, as described under No. W7356, but 50 feet long, and with reverse side graduated to give diameter in feet, inches and 10ths of an inch direct from a circumference measurement.

W7358. STEVENS WYTEFACE ^{TRADE MARK} Steel Diameter (Tree) Tape as described under No. W7356, but 50 feet long; and one side graduated in feet, inches and 8ths of an inch, other side graduated to give diameters in feet, inches, and 64ths of an inch direct from a circumference measurement. The diameter equivalents of 64ths of an inch are given in an extra diameter inch before zero.

For other diameter tapes, see page 525.

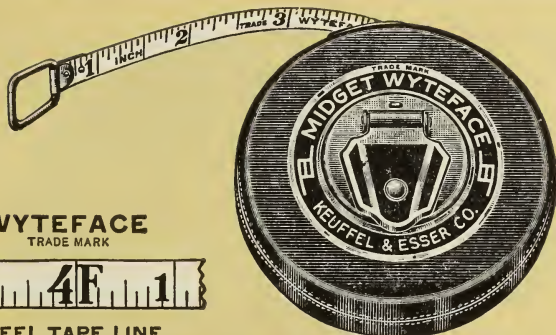


KECO BLACK FINISH TAPES. $\frac{3}{8}$ in. wide. with etched graduations and brown leather case embossed "HOME" will be furnished if so ordered.

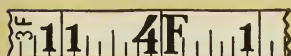
KEUFFEL & ESSER CO., NEW YORK

K & E STEEL TAPES.

REG. U. S. PAT. OFF



WYTEFACE
TRADE MARK



STEEL TAPE LINE

MIDGET WYTEFACE Steel Tapes, $\frac{1}{4}$ in. wide, stout bent black leather case, long folding self-opening handle. Patented friction brake. Chromium plated mountings. Graduations begin at outside end of ring.

"Ready Reading"	Length in feet.	25	50	100
Feet, inches & 16ths		No. W7360T	W7362T	W7365T
Feet, 10ths & 100ths ft.		W7360D	W7362D	W7365D

The Midget Steel Tape meets the demand for an accurate and durable steel tape of convenient size for the pocket, at a low price.



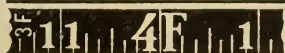
KECO Finish.

ARMOR Steel Tapes, $\frac{3}{8}$ in. wide, strong steel case, large center with long folding self-opening handle. Patented friction brake. Case and mountings nickelplated. Graduations begin at outside end of ring.

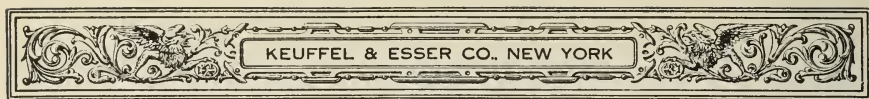
"Ready Reading"	Length in feet,	25	50	100
Feet, inches & 8ths		No. 7370T	7372T	7375T
Feet, 10ths & 100ths ft.			7372D	7375D

	Length in Meters,	15	30
Metric to $\frac{1}{2}$ cm. throughout (one side only) . . .		No. 7372M	7375M
Metric, other side feet, inches & 8ths		7372TM	7375TM

Note: The graduations of metric tapes begin on the line; and the first decimeter is divided to millimeters.



MIDGET TAPES, KECO BLACK FINISH with etched graduations and brown leather case will be furnished if so ordered.



K & E STEEL TAPES.

REG. U. S. PAT. OFF.

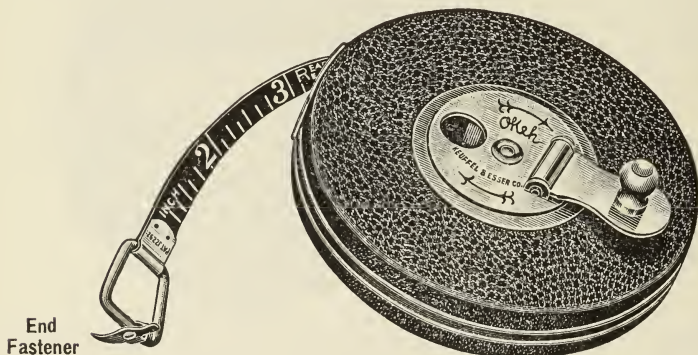
KECO Finish.



HANDY Steel Tapes, $\frac{3}{8}$ inch wide, black sewed leatherite case, plain center with long folding, self-opening handle. Patented friction brake. Nickel-plated mountings. Graduations begin at outside end of ring.

"Ready Reading"	Length in feet,	25	50	100
Feet, inches & 8ths	No. 7383T	7384T	7386T	
Feet, 10ths & 100ths ft.	7383D*	7384D*	7386D*	

*To order only.



O'Keh Steel Tapes, $\frac{3}{8}$ inch wide, strong metal case covered with leatherite, self-opening handle Patented friction brake. Nickel-plated mountings. Graduations begin at outside end of ring.

"Ready Reading"	Length in feet.	25	50	100
Feet, inches & 8ths	No. N7390	N7392	N7395	
Feet, inches & 8ths, with K & E End Fastener	N7390P	N7392P	N7395P	

Nos. N7390 to N7395P are old Nos. 7890 to 7890P.

KEUFFEL & ESSER CO. NEW YORK

TIP TOP

REG. U. S. PAT. OFF.

WYTEFACE STEEL POCKET TAPES.

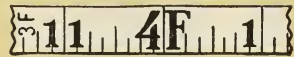
TRADE MARK

SPRING WINDING.

The length of these tapes is marked on the line before the zero point.



WYTEFACE
TRADE MARK



STEEL TAPE LINE

TIP TOP WYTEFACE Steel Pocket Tapes, $\frac{1}{4}$ in. wide, nickelplated case, spring winding, with stop at center. Graduations begin on the line.

Length in inches,	36	60	72
Inches to 16ths (one side)	No. W7397T-3	W7397T-5	W7397T-6
Inches to 16ths, other side,			
feet to 10ths and 100ths ft.	W7397TD-3	W7397TD-5	W7397TD-6

Length in Meters,	1	1½	2
Inches to 16ths, other side millimeters	No. W7397TM-3	W7397TM-5	W7397TM-6

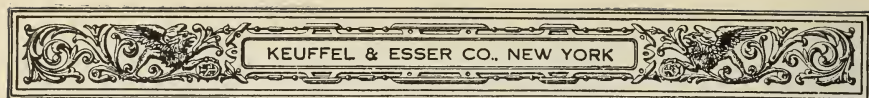
TIP TOP WYTEFACE Steel Pocket Tapes with scale, for quickly measuring scale drawings, blue prints, etc.

Length in inches,	60
Scale $\frac{1}{8}$ in. to the foot, other side	
scale $\frac{1}{4}$ in. to the foot,	No. W7398A
Inches to 16ths, other side	
scale $\frac{1}{4}$ in. to the foot,	No. W7398-4
Inches to 16ths, other side	
scale $\frac{1}{8}$ in. to the foot,	No. W7398-8

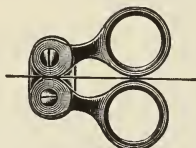
W7399. TIP TOP WYTEFACE Steel Pocket Diameter Tape, $\frac{1}{4}$ in. wide, 10 feet; one side in feet, inches and 16ths of an inch, other side graduated to give diameter in inches and 64ths of an inch direct from a circumference measurement. The diameter equivalents of 64ths of an inch are given in an extra diameter inch before zero.

For other Diameter Tapes, see page 522.

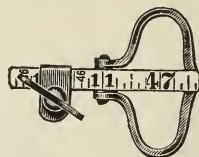
For description of WYTEFACE Tape Lines, see page 506.



HANDLES FOR TAPES.



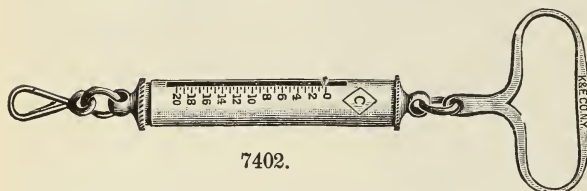
No. 7400.



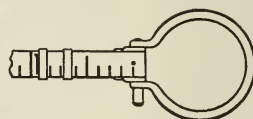
No. 7401.

7400. Clamping Handles, Brass, nickelplated, for gripping any part of a tape to exert tension.

7401. Clamping Handles, brass, bronzed, to attach to any part of tape to exert tension.



7402.



No. 7405.

7402. Tension Handles, brass, nickelplated, indicating tension up to 20 lbs., reading by half pounds.

7402M. Tension Handles, like No. 7402, but indicating tension up to 10 Kilograms.

7403. Tension Handles, like No. 7402, but indicating tension up to 30 lbs.

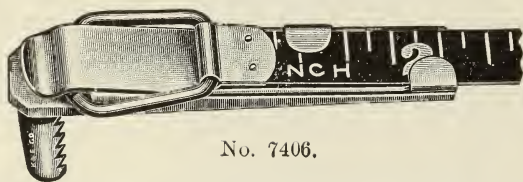
7403M. Tension Handles, like No. 7402, but indicating tension up to 15 Kilograms.

These tension handles form a very valuable addition to a tape, since they enable the user to apply exactly the tension at which the tape is standard. They are recommended, also, for use with the fine narrow tapes.

7405. Plain Brass Handles, Nickelplated, for Paine's Pattern Tapes.

No. 7405 is old No. 7390.

TAPE HOOK

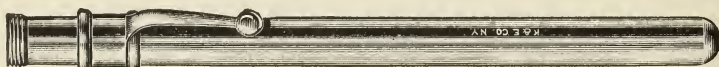
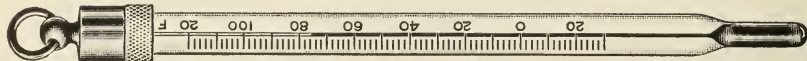


No. 7406.

7406. Tape Hook, aluminum, for tapes $\frac{3}{8}$ inch wide; fitting K & E Cornell, Stevens, Home, Handy, Armor and Okeh tapes in feet and inches.

No. 7406 is old No. 7395.

POCKET THERMOMETERS.



7408. Pocket Thermometers, mercurial, 5 in., Fahrenheit, opal glass scale reading to 2 degrees from -30° to $+120^{\circ}$; in nickelplated brass Case.

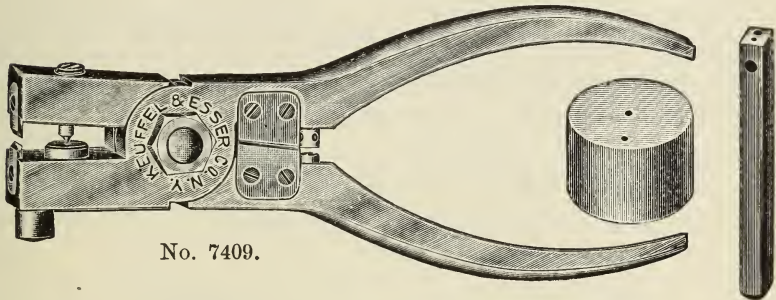
No. 7408 is old No. 5930.



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STEEL TAPES.

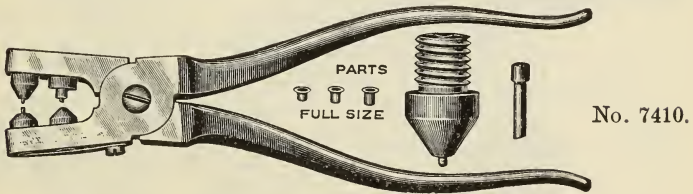
TAPE MENDING APPLIANCES.



No. 7409.

7409. K & E Tape Mending Outfit, one punching pliers with end nipper, shears and hammer, all combined in one tool. One extra punch for pliers. One rivet set, one small anvil. One box of rivet pins. One clamp, several pieces of $\frac{3}{8}$ in. tape steel; in canvas bag.

No. 7409 is old No. 7095.



No. 7410.

7410. K & E Tape Mending Tool, combined puncher and riveter, 8 in., a light and convenient tool for quickly repairing tapes in the field.

Tool, with 1000 eyelets (500 each of two sizes).

Extra eyelets (500 in a package).

No. 7410 is old No. 7098.

REPAIRING TAPES.

Repairs on steel or woven tapes will be promptly attended to at a moderate charge, either at the General Office, Hoboken, N.J., or at the K & E Co. Branch Houses in New York, Chicago, St. Louis, San Francisco and Montreal.

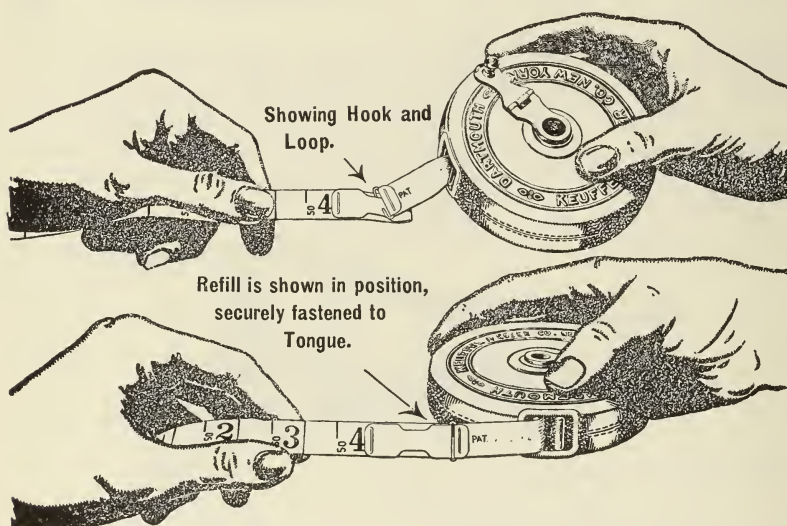
KEUFFEL & ESSER CO., NEW YORK

K & E
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WOVEN TAPES.

K & E Woven Tapes are manufactured from the best material obtainable. They are impregnated and finished by a special process so that they will stand up under severe use. However, all woven tapes, both linen and metallic, of any make, are liable to stretch or shrink. Hence woven tapes should never be used for exact measurements, for which an accurate steel tape should be employed.

METHOD OF INSERTING RE-FILLS IN TAPE CASES.



The above illustrations show the method employed for inserting K & E refills in tape cases. A short strip (or tongue) of woven tape line is attached by a loop to the binding post of the tape case. The other end of the tongue has a special form of hook over which is slipped the specially constructed loop in the end of the re-fill, in the manner shown in the illustration.

K & E Harvard, Dartmouth, Piccolo, Excelsior and Samson Tapes are furnished with this patented tongue, and re-fills for the above tapes have this type of loop.

KEUFFEL & ESSER CO., NEW YORK

K & E

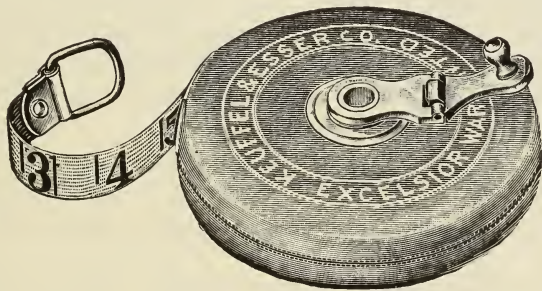
REG. U. S. PAT. OFF.

WOVEN TAPES

EXCELSIOR ENGINEER'S TAPE.

REG. U. S. PAT. OFF.

Excelsior Engineer's Tape is a woven tape in the best bent leather case. One side is marked in feet, tenths and half tenths for ordinary measurements, while the other side is marked for setting Slope Stakes or for finding the center from the Slope Stakes after the Center Stake has been removed. The Slope Stake markings are as follows: graduations are placed at every foot and half foot for 13 feet from the end of the ring, and numbered in black from 13 at the end of the ring to 0 at 13 feet in from the end of the ring. From the 0 mark onward the graduations are spaced at $1\frac{1}{2}$ times their designated markings, i. e. the graduation 1 ft. is actually 1.5 ft. from 0 and so on. The final mark, 24, is actually 36 ft. from the 0 mark. The tape eliminates calculation of distance out to toe of slope; reduces the work of the levelman to a minimum; and saves considerable time in the setting of slope stakes. A pamphlet—"How to Set Slope Stakes"—giving full particulars of the method of using them, is supplied with each of these tapes.



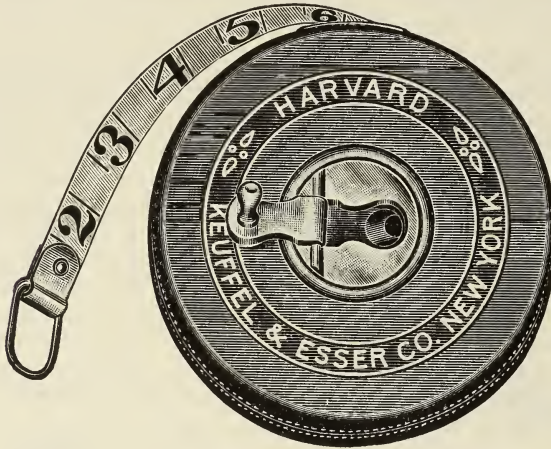
***7411. EXCELSIOR Engineer's Metallic Woven Tape, Ward's Patent, 50 feet, of same quality as No. 7442 (page 531) in bent leather case, long folding handle. For roadbeds up to 26 ft. wide, and slopes of $1\frac{1}{2}$ to 1. Graduations begin at outside end of ring. All mountings nickelplated. With Directions.**

*Made to order only.



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WOVEN TAPES.

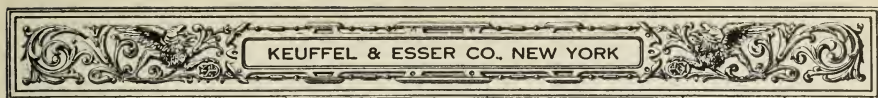


HARVARD TRADE MARK Metallic Woven Tapes, $\frac{5}{8}$ in. wide, stout bent leather case, long flush folding handle, opened by pushing handle grip from opposite side of case. All mountings nickelplated. Leather reinforced end. Graduations begin at outside end of ring.

"Ready Reading."	Length in feet,	25	50	75	100	
Feet, inches & $\frac{1}{2}$ in.	No.	7420T	7422T	7424T	7425T	
Feet, 10ths & half 10ths ft.		7420D	7422D	7424D	7425D	
	Length in Meters.	10	15	20	25	30
Metric, to cm. throughout . .	No.	7421M	7422M	7423M	7424M	7425M
(one side only)						
Metric, other side feet, inches & $\frac{1}{2}$ in.		7421TM	7422TM	7423TM	7424TM	7425TM

Note: The graduations of metric tapes begin on the line.

For lines without cases (Re-fills), see page 531.



K & E
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WOVEN TAPES.



DARTMOUTH Metallic Woven Tapes, $\frac{5}{8}$ in. wide, stout bent leather case, long folding handle. All mountings nickelplated. Leather reinforced end. Graduations begin at outside end of ring.

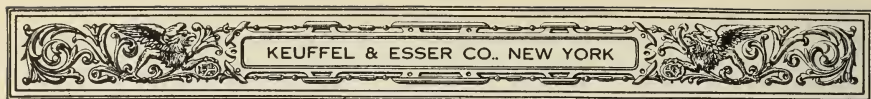
"Ready Reading"	Length in feet,	25	50	75	100	
Feet, inches & $\frac{1}{2}$ in.	No. 7440T	7442T	7444T	7445T		
" " " with K & E End Fastener	7440P	7442P	7444P	7445P		
Feet, 10ths & half 10ths ft.	7440D	7442D	7444D	7445D		
Feet, inches, $\frac{1}{2}$ in. and Links	7440TL	7442TL	7444TL	7445TL		
Feet, 10ths, half 10ths ft. and Links . .	7440DL	7442DL	7444DL	7445DL		
	Length in Meters,	10	15	20	25	30
Metric to cm. throughout . . .	No. 7441M	7442M	7443M	7444M	7445M	
(one side only)						
Metric, other side feet, inches & $\frac{1}{2}$ in.	7441TM	7442TM	7443TM	7444TM	7445TM	

METALLIC WOVEN TAPES REFILLS

FOR HARVARD AND DARTMOUTH TAPES.

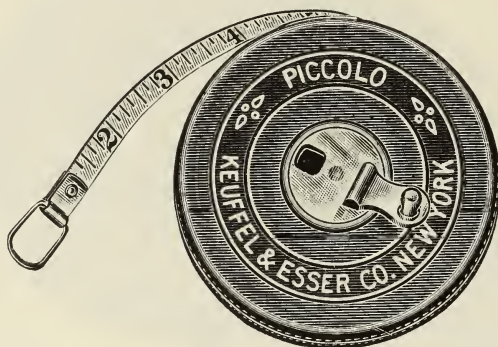
"Ready Reading"	Length in Feet	25	50	75	100	
Feet, inches & $\frac{1}{2}$ in.	No.	7460T	7462T	7464T	7465T	
" " " with K & E End Fastener		7460 P	7462 P	7464 P	7465 P	
Feet, 10ths & half 10ths ft.		7460 D	7462D	7464D	7465 D	
Feet, inches, $\frac{1}{2}$ in. and Links		7460TL	7462TL	7464 TL	7465 TL	
Feet, 10ths, half 10ths ft. & Links . . .		7460DL	7462DL	7464DL	7465DL	
	Length in Meters,	10	15	20	25	30
Metric to cm. throughout . . .	No.	7461M	7462M	7463M	7464M	7465M
(one side only)						
Metric, other side feet, inches, & $\frac{1}{2}$ in.		7461TM	7462TM	7463TM	7464TM	7465TM

Note: The graduations of metric tapes begin on the line.



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WOVEN TAPES.



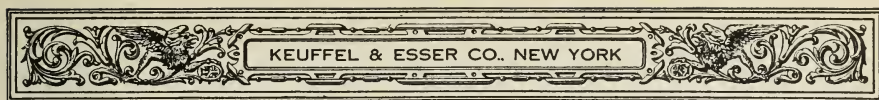
PICCOLO TRADE MARK Metallic Woven Tapes, 7/16 in. wide, stout bent leather case, large center, long folding self-opening handle, all mountings nickel-plated, line reinforced with leather. Graduations begin at **outside end of ring.**

"Ready Reading."	Length in feet,	25	50
Feet, inches & 8ths	No.	N7480T	N7482T
Feet, 10ths & 100ths ft.		N7480D	N7482D

METALLIC WOVEN TAPES RE-FILLS FOR PICCOLO TAPES.

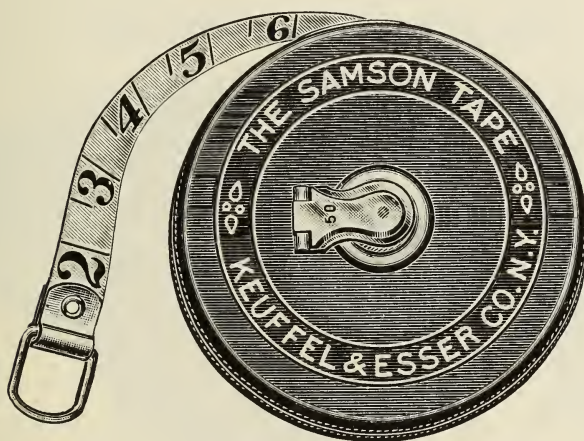
"Ready Reading."	Length in feet,	25	50
Feet, inches & 8ths	No.	N7470T	N7472T
Feet, 10ths & 100ths ft.		N7470D	N7472D

Piccolo Woven Tapes are warranted to be of the same grade and workmanship as the Dartmouth K & E Woven Tapes. They differ from the Dartmouth only in size and weight, being very compact and light and, therefore, suitable and convenient for the pocket. For general description of this tape see page 528.



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WOVEN TAPES.



Line Guaranteed
Non Metallic.

SAMSON Woven Tapes, $\frac{5}{8}$ in. wide, stout bent leather case, long folding handle. All mountings nickelplated. Extra-heavy line, reinforced end. Graduations begin at outside end of ring.

"Ready Reading."	Length in feet,	25	50	75	100
Feet, inches & $\frac{1}{2}$ in.	No.	7490T	7492T	7494T	7495T
Feet, 10ths & half 10ths ft. . .		7490D	7492D	7494D	7495D

The Samson is a woven line which surpasses all others in durability, and is made especially to withstand the severe conditions of railroad construction, lumbering, dock building, mining, etc. The line is very closely woven and has a coating which protects it from moisture. The tape will prove highly efficient where steel tapes and other woven lines do not give satisfaction owing to their being affected by dampness. Since it has **no metal interwoven in the fabric**, it is a non-conductor of electricity. This fact and its durability have rendered it deservedly popular for measurements in the vicinity of electrical installations.

WOVEN TAPES RE-FILLS

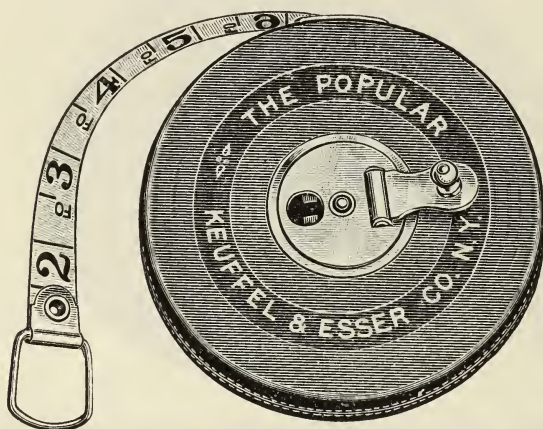
FOR SAMSON TAPES

"Ready Reading."	Length in feet,	25	50	75	100
Feet, inches & $\frac{1}{2}$ in.	No.	7500T	7502T	7504T	7505T
Feet, 10ths & half 10ths ft. . .		7500D	7502D	7504D	7505D



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WOVEN TAPES.



POPULAR Woven Tapes, $\frac{5}{8}$ in. wide, substantial bent leather case, flat folding self-opening handle. All mountings nickelplated. Stout woven line, end reinforced with leather. Graduations begin at outside end of ring.

"Ready Reading".	Length in feet,	25	50	75	100
Feet, inches & $\frac{1}{2}$ in.	No.	N7510T	N7512T	N7514T	N7515T

The POPULAR is a low-priced, well-made woven tape in stout bent leather case, with durable center and handle. The line is of the usual width and finish of K & E woven tapes, heavily coated, and has leather reinforced end.

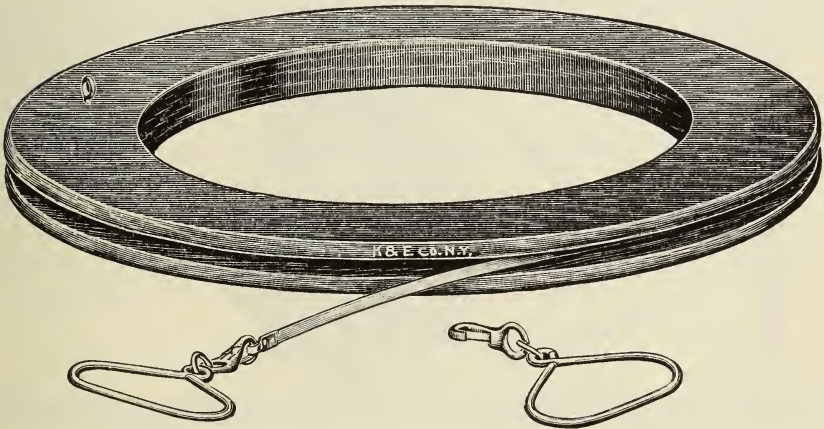


K & E
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LO-VAR TAPES

REG. U. S. PAT. OFF.

FOR BASE LINE MEASUREMENTS.



LO-VAR Tapes, are $\frac{1}{4}$ inch wide, .02 inch thick; and have a coefficient of expansion of about .0000015 per degree Centigrade (about .00000083 per degree Fahrenheit), as against .0000116 per degree Centigrade (about .00000645 per degree Fahrenheit) for the ordinary steel tapes.

Since **LO-VAR Tapes** are intended for precise base line measurements, they carry only the end marks and one or two intermediate marks. Further subdivision is not recommended.

- 7590 A.** **LO-VAR Tape**, $\frac{1}{4}$ in. wide, 50 ft., graduated at 0 and 50 ft. only, on mahogany reel.
- 7590 B.** **LO-VAR Tape**, $\frac{1}{4}$ in. wide, 100 ft., graduated at 0, 50 and 100 ft. only, on mahogany reel.
- 7590 C.** **LO-VAR Tape**, $\frac{1}{4}$ in. wide, 150 ft., graduated at 0, 50, 100 and 150 ft. only, on mahogany reel.
- 7590 BM.** **LO-VAR Tape**, $\frac{1}{4}$ in. wide, 30 Meters, graduated at 0, 15 and 30 meters only, on mahogany reel.
- 7590 CM.** **LO-VAR Tape**, $\frac{1}{4}$ in. wide, 50 Meters, graduated at 0, 25 and 50 meters only, on mahogany reel.

A suitable spring balance, such as the Tension Handles described on page 526, should be used with these Tapes.

Thermometers (Fahrenheit or Centigrade) which can be clamped to the tape, will be furnished upon order. Prices on request.

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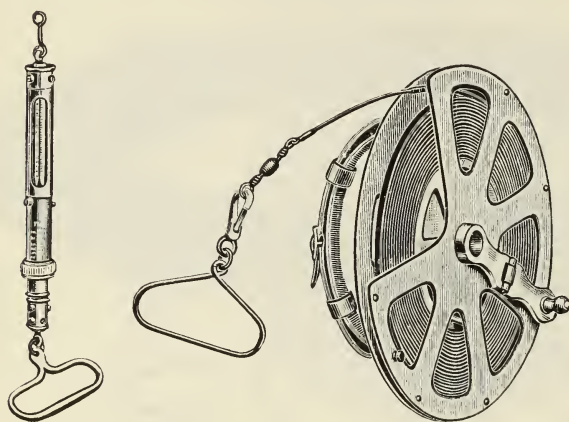
K & E

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CITY ENGINEER'S STANDARD TAPE.

KECO Finish.

(Not Subdivided.)



No. 7600

7600. City Engineer's Standard Tape, $\frac{3}{32}$ in. wide, 50 ft., plated to prevent rust, with improved spring balance adjustable for temperature, with level and thermometer, two nickelplated handles, on aluminum reel.

7601. City Engineer's Standard Tape, like No. 7600, but 100 ft.

The spring balance consists of two telescoping nickel silver tubes connected by a strong spring; the inner tube carries the spirit level and tension mark, and the outer one carries the thermometer which is protected by a revolving semi-tubular cover. The thermometer reads to 5 degrees, and is correct to 1 degree; reading being made easy by means of a magnifying prism face. A knurled clamping ring encircles the outer tube; in it is cut a V-shape groove representing the **END MARK** of the measure. The spring balance up to the groove in the ring is **INCLUDED IN THE MEASURE**. On the outer tube is engraved the temperature scale, which compensates expansion and contraction and is marked with the corresponding degrees Fahrenheit. Correction for temperature, *i. e.* allowance for contraction and expansion is made by adjusting the clamping ring on the temperature scale to the degree indicated by the thermometer. The starting point is marked by another V-shape groove in a nickel silver plate at the other end of the tape. **There are no intermediate graduations on this tape, and the tension and temperature corrections apply to its entire length only.**

DIRECTIONS.

To use this tape, adjust the clamping ring according to the temperature as read on the thermometer, then bring the V-shape zero groove in the nickel silver lug at the other end of the line exactly over the starting point by means of a suspended plumbbob; pull the telescoping handle until the tension marks coincide, and bring the tape into a horizontal plane by means of the spirit level. A second plumbbob suspended from the V-shape groove on the spring balance will then indicate the terminal point on the ground.



K & E
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FLAT WIRE STEEL TAPES

These tapes are made of the best and toughest flexible steel ribbon, carefully tempered to prevent breaking or kinking.

Etched tapes can be furnished nickelplated but they cannot be furnished plated with white metal. Tapes plated with white metal cannot be furnished with end units etched.

ETCHED GRADUATIONS.

KECO FINISH.

The lines of K & E etched wire tapes are black with bright numbers and graduations, which are etched in a manner that insures their durability in rough work.

Graduated in feet, extra foot to 10ths and 100ths ft.



No. 7607.

- 7607. Flat Wire Tapes,** KECO finish, $\frac{1}{8}$ in. wide, etched, graduated at every foot, extra foot before zero subdivided to 10ths and 100ths ft. (See page 542.) They can be furnished in any length from 100 feet up to 500 feet; 2 detachable nickelplated brass handles.

Graduated, feet to 10ths and 100ths ft. throughout.



No. 7608.

- 7608. Flat Wire Tapes,** KECO finish, $\frac{1}{8}$ in. wide, etched to 10ths and 100ths ft. They can be furnished in any length from 100 feet up to 300 ft. 2 detachable nickelplated brass handles.

No. 7607 with end feet subdivided instead of extra subdivided foot BEFORE zero, furnished to order without extra charge. (See page 542.)

Reels are listed separately (see pages 539 to 541) and are not included in the price of these tapes.

Fine flat wire steel tapes graduated in Links, Meters, Varas, or other measures, furnished to order at short notice.



K & E
REG. U. S. PAT. OFF.

FLAT WIRE STEEL TAPES

GRADUATED ON BRASS SLEEVES.

K & E Fine Flat Wire Steel Tapes with brass sleeves are of the most improved type. The sleeves are firmly clamped (or clamped and soldered) and are notched directly opposite the graduation, for the exact locating of the plumb-bob cord. The ends of the sleeves are beveled to prevent their catching on obstructions when measuring, or on each other when winding or unwinding the tape.

These Tapes can be made in any length up to 500 feet, without joints.

Graduations on clamped sleeves.



No. 7610.

- 7610.** Flat Wire Tapes, $\frac{1}{8}$ in. wide, graduated on **clamped tubular brass sleeves**, line heavily plated with **white metal** (to resist rust), 2 detachable nickel-plated brass handles, graduated every foot, extra foot before zero subdivided to 10ths, (see page 542.) They can be furnished in any length from 100 feet up to 500 feet.

Graduations on clamped and soldered sleeves.



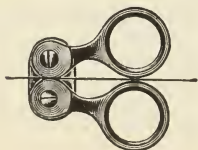
No. 7613.

- 7613.** Flat Wire Tapes, $\frac{1}{8}$ in. wide, graduated on **clamped tubular brass sleeves** carefully soldered to the tape, to prevent corrosion from moisture entering between sleeves and tape line, heavily plated with **white metal** (to resist rust), 2 detachable nickelplated brass handles, graduated every foot, extra foot before zero sub-divided to 10ths (see page 542). They can be furnished in any length from 100 feet up to 500 feet.

These tapes with end feet subdivided instead of extra subdivided foot before zero, furnished to order without extra charge, (see page 542).

Reels are listed separately (see pages 539 to 541) and are not included in the price of these tapes.

Fine flat wire steel tapes graduated in Links Meters, Varas, or other measures, furnished to order at short notice.



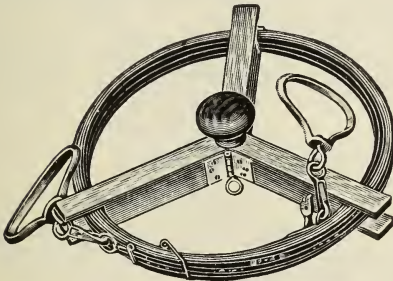
For Clamping Handle to grip any part of tape line,
and for Tension Handles, see page 526.

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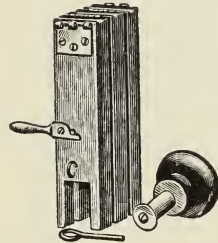
K & E

REG. U. S. PAT. OFF.

HARDWOOD REELS FOR FLAT WIRE STEEL TAPES

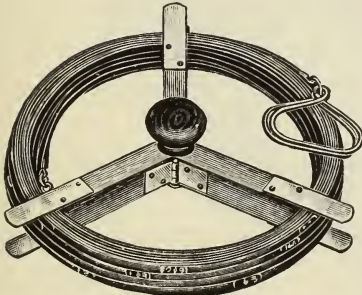


7650 A-1.

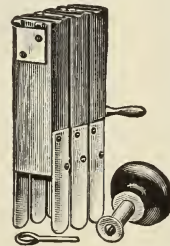


7650 A-1
folded

7650 A-1. Folding Reel, hardwood, plain brass handle and hook to hold one end of line when reeling up; spring clamp to prevent line from unreeling. For flat wire tapes Nos. 7607 and 7608, 100 to 300 ft. long; and flat wire tapes Nos. 7610 and 7613, 100 to 200 ft. long.



7650 A-3



7650 A-3 folded.

7650 A-3. Folding Reel, hardwood, similar to 7650 A-1, but reinforced with metal plates. For flat wire tapes No. 7607 and 7608, 400 and 500 ft. long, and flat wire tapes Nos. 7610 and 7613, 300 to 500 ft. long.

REELS ONLY. The lines shown on some of the cuts of the reels are for better illustration.

For reels to carry extra long lines, see also page 541.

When ordering reels separately, please state for which length of line and kind of graduation.

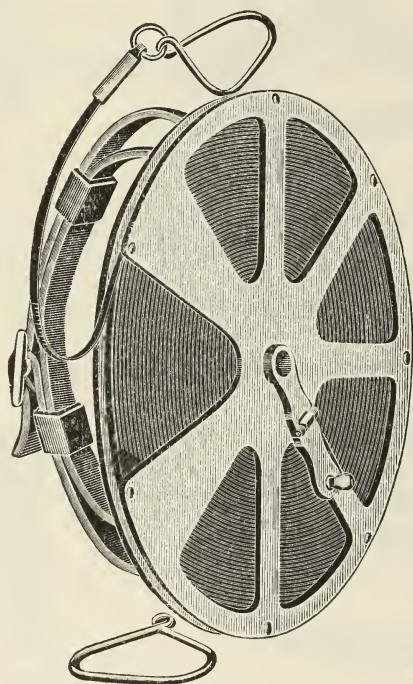
KEUFFEL & ESSER CO., NEW YORK

K & E
REG. U. S. PAT. OFF.

METAL REELS FOR FLAT WIRE STEEL TAPES.

The reels here described embody all the latest improvements, the result of years of experience and study. They fill a long-felt want, in that they provide a convenient means for rapidly and correctly assembling the narrow flat wire tapes into a compact and portable form or unit.

Any of the Steel Tapes listed under Nos. 7607 to 7613 can be furnished on the reels here listed, with such limitations as to length as are stated in the descriptions of the reels.



7650 C-1. K & E Aluminum Reel with leather strap handle, large center with long folding handle. For lines Nos. 7607 and 7608 (page 537), 100 ft. long.

7650 C-2. Similar to No. 7650 C-1, but for lines Nos. 7607 and 7608 (page 537), 200 ft. long, and lines Nos. 7610 and 7613, inclusive (page 538), 100 ft. long.

REELS ONLY. The lines shown in the cuts of the reels are for better illustration.

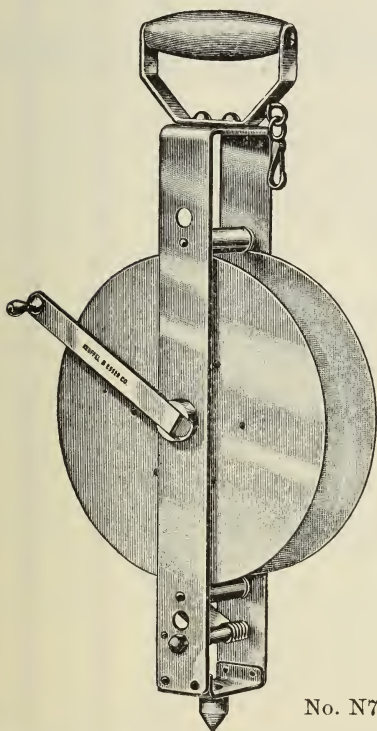
For reels to carry extra long lines, see page 541.

When ordering reels separately, please state for which length of line and kind of graduation.

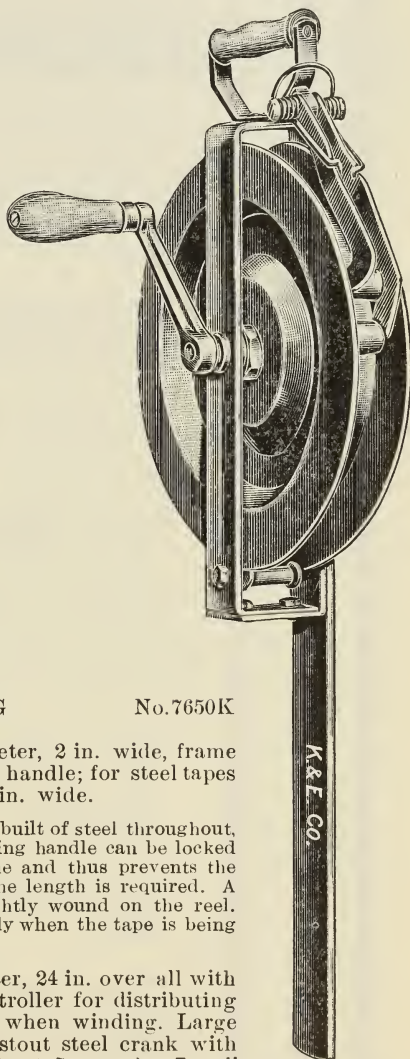
KEUFFEL & ESSER CO., NEW YORK

K & E
REG. U. S. PAT. OFF.

REELS FOR EXTRA LONG STEEL TAPE LINES.



No. N7650G



No. 7650K

N7650G. Colorado Steel Reel, 8 in. diameter, 2 in. wide, frame 17 in. long; long folding lock handle; for steel tapes 100 to 500 feet long, up to $\frac{5}{16}$ in. wide.

The K & E Colorado Reel is substantially built of steel throughout, with hardwood supporting grip. A long folding handle can be locked into an opening at either end of the frame and thus prevents the tape from unwinding when only a part of the length is required. A spring hold-down roller keeps the line tightly wound on the reel. A spike point admits of bracing the reel firmly when the tape is being wound or unwound.

7650 K. Mine Reel, steel, 10 in. diameter, 24 in. over all with arm extended. Spooling controller for distributing the line evenly on the reel when winding. Large roller to mouth piece. Long stout steel crank with hardwood handle. Weight about 5 pounds. **For all flat wire tapes and band chains** up to $\frac{5}{16}$ in. wide from 300 to 500 feet long (or 90 to 150 meters long.)

The K & E Mine Reel will be found very convenient for use in mines. It is of steel and very substantially built. The folding steel arm, when extended, supports the reel while winding the tape and is folded across the reel when not required.

When ordering, please mention kind of tape, also width and length, for which the reel is intended.

KEUFFEL & ESSER CO., NEW YORK

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BAND CHAINS.

Band Chains are intended to be used where the service is too severe for the ordinary type of measuring tapes.

They are made of heavy, tough, durable steel; and the nearly ineffaceable graduations and numbers make them particularly suitable for mining, high-way and difficult survey work of all types.

The heavy end loops of all K & E Band Chains are made of stainless steel, rivetted to the ends of the line.

K & E Band Chains are furnished in three styles of end graduations, as follows (see illustrations).

Style "K" — Extra foot before zero, subdivided to read backwards.

The style "K" graduations terminate at the marks representing (a) 0.9 of a foot, and (b) 0.99 of a foot, depending upon the type of subdivision employed.

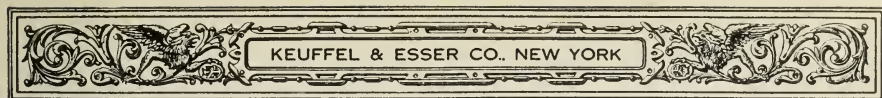
Style "L" — First and last foot, first and last link or first and last meter subdivided. Six inch blank space at beginning and end of line.

Style "M" — First and last foot subdivided. End loops attached at zero and final marks.

All chains divided to feet will be furnished in style "K," unless style "L" or "M" is specifically ordered.

All chains with divisions other than the foot will be furnished in style "L" unless some other arrangement is specifically ordered.

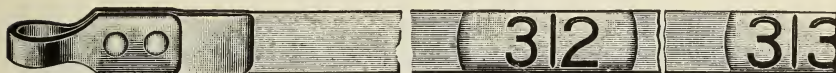




K & E
REG. U. S. PAT. OFF.

DREADNAUGHT BAND CHAINS

TRADE MARK



DREADNAUGHT Band Chains are plated with white metal to resist rust and are accurately graduated and plainly numbered on Babbitt metal bosses. The numerals and graduations are marked so deep into the bosses that the babbitt must be practically worn away before the markings are obliterated. Since no water can enter between the babbitt metal bosses and the band chain to produce corrosion, they are well adapted to use in mines.

DREADNAUGHT Band Chains are furnished with style "K" "L" or "M" (see page 542) graduation in feet, the extra foot or end feet subdivided to 10ths on Babbitt Metal. Where divided in links they have the style "L" graduation, with graduations and numbers at every link and end links divided to 10ths of links. Where divided in the metric system they have the style "L" graduation, with graduations and numbers at every half meter and end meters divided to decimeters.

DREADNAUGHT Band Chains are furnished as lines only, or on the Champion reels described on page 544. They can also be used on the Conqueror and Ironclad reels (see pages 548 and 549).

DREADNAUGHT Band Chains without reels are regularly furnished with two rawhide thongs unless nickelplated handles are specified.

Specify style of end graduation wanted.

7660A Dreadnaught Band Chain, 5/16 in. wide, 50 feet.

No. 7660A is old No. 7681A-5.

7660B " " " " " 100 "

No. 7660B is old No. 7681B-5.

7660C " " " " " 200 "

No. 7660C is old No. 7681C-5.

7660D " " " " " 300 "

No. 7660D is old No. 7681D-5.

7660-6 " " " " " 66 " (100 links)

No. 7660-6 is old No. 7681BL-5.

7660-13* " " " " " 132 " (200 ")

No. 7660-13 is old No. 7681CL-5

7660-25 " " " " " 25 meters

No. 7660-25 is old No. 7681BM-5.

7660-50 " " " " " 50 "

No. 7660-50 is old No. 7681CM-5.

If so ordered a half-gauge (2 ft. 4¼ in.) mark is provided, at no extra charge.

3/16 or 1/4 in. width lines can be furnished on order at no extra charge.

*To order only.

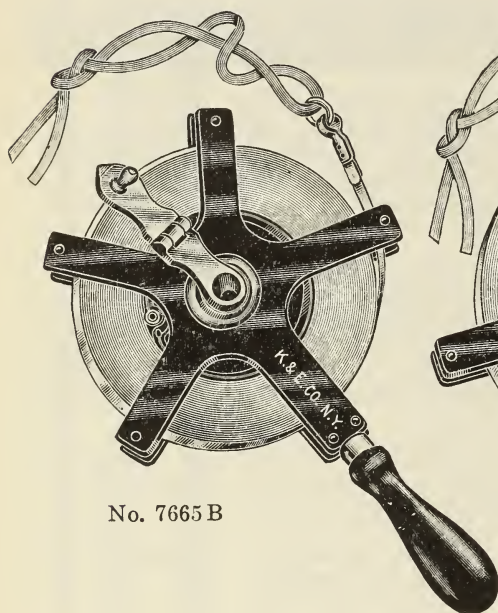


K & E
REG. U. S. PAT. OFF.

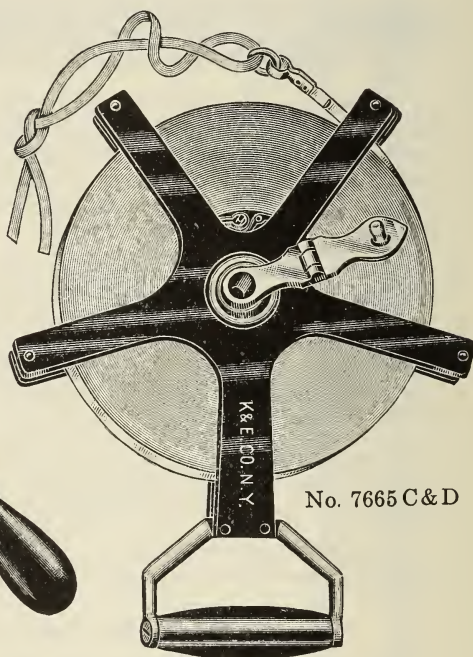
DREADNAUGHT BAND CHAINS ON CHAMPION REELS.

TRADE MARK

TRADE MARK



No. 7665 B



No. 7665 C & D

The Champion Reel has an aluminum frame with black hardened surface. The five metal arms of the reel are so arranged that they hold even the longest chains in position without overlapping. The large center gives durability, and, with the long handle, provides easy leverage for winding. Nos. 7665 A, B, -6 and -25 have a black finished grip of the usual type, whereas Nos. 7665 C, D, -13 and -50 have a black finished D grip. The grips are hardwood.

The heavy DREADNAUGHT lines are as described on page 543, and are furnished with two rawhide thongs unless nickelplated handles are ordered.

Specify style of end graduation wanted.

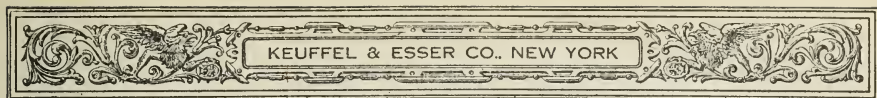
7665A.	Dreadnaught line on	Champion Reel No. 7688B,	5/16 in. wide,	50 ft.
No. 7665A is old No. 7701A-5.				
7665B.	"	No. 7688B,	"	100 "
No. 7665B is old No. 7701B-5.				
7665C.	"	No. 7688C,	"	200 "
No. 7665C is old No. 7701C-5.				
7665D.	"	No. 7688D,	"	300 "
No. 7665D is old No. 7701D-5.				
7665-6.	"	No. 7688B,	"	66 " (100 links)
No. 7665-6 is old No. 7701BL-5.				
*7665-13.	"	No. 7688C,	"	132 " (200 links)
No. 7665-13 is old No. 7701CL-5.				
7665-25.	"	No. 7688B,	"	25 meters
No. 7665-25 is old No. 7701BM-5.				
7665-50.	"	No. 7688C,	"	50 meters
No. 7665-50 is old No. 7701CM-5.				

*To order only.

For style of end graduations "K" "L" or "M" see page 542.

If so ordered a half gauge (2 ft. 4 1/4 in.) mark is provided, at no extra charge. 3/16 or 1/4 in. width lines on reels can be furnished on order.

For other reels for Dreadnaught Band Chains, see pages 549 to 552.



K & E
REG. U. S. PAT. OFF.

INVINCIBLE BAND CHAINS

REG. U. S. PAT. OFF.



INVINCIBLE Band Chains are etched lines with graduations in high relief at every foot, end feet (as per options “K”, “L” or “M”, page 542) to 10ths and 100ths of a foot. The bright graduations and numbers stand well above the black finish of the line proper; so that no depression exists where dirt, moisture or corrosive substances may accumulate. The absence of depressions insures that there are no weakened sections of the line at which the tape might crack if bent sharply. The numbers and graduations are always visible, and are protected on either side by triangular shaped etchings, also in relief, which take up considerable of the wear and tear that would otherwise tend to eliminate the graduations and numbers.

INVINCIBLE Band Chains are designed to withstand heavy dragging under the most severe conditions. The graduations and numbers will remain legible after long service, and will not become illegible through clogging. The foot-marks can be readily located by the fingers.

INVINCIBLE Band Chains are furnished as lines only, or on the Champion reels described on page 546. They can also be used on the Conqueror and Ironclad reels (see pages 549 and 550).

INVINCIBLE Band Chains are furnished with two tough rawhide thongs, unless nickelplated handles are ordered.

Specify style of end graduation wanted.

7670A.	INVINCIBLE Band Chain, 5/16 in. wide, 50 feet				
7670B.	“	“	“	“	100 “
7670C.	“	“	“	“	200 “
7670D.	“	“	“	“	300 “

Nos. 7670A to 7670D are old Nos. 7686A to 7686D.

If so ordered a half-gauge (2 ft. 4 1/4 in.) mark will be etched on the line at no extra charge.

For reels for **INVINCIBLE Band Chains**, see page 546 and pages 549 to 552.

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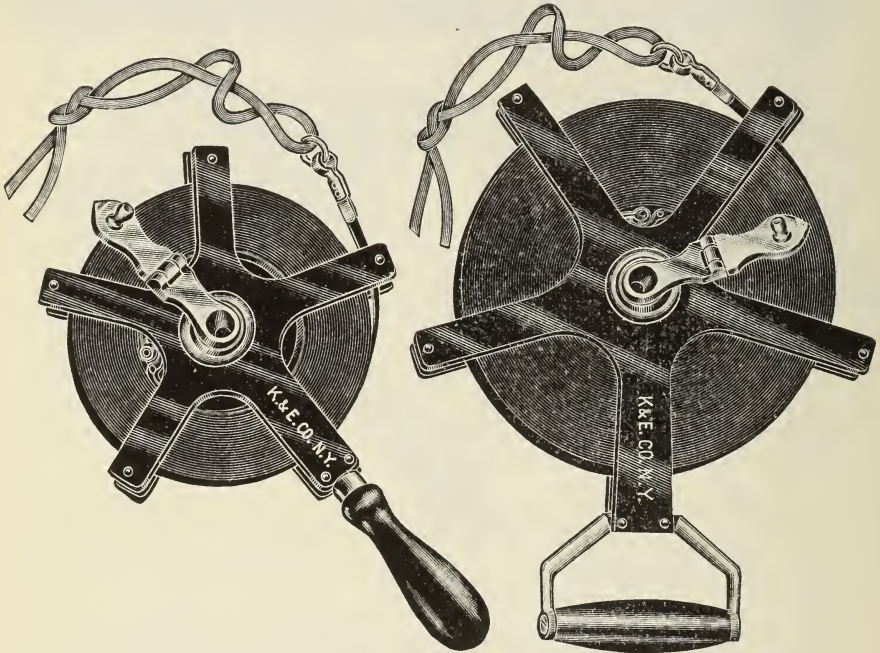
K & E

REG. U. S. PAT. OFF.

INVINCIBLE BAND CHAINS ON CHAMPION REELS.

TRADE MARK

TRADE MARK



No. 7675A & B

No. 7675C & D

The **Champion Reel** has an aluminum frame with black hardened surface. The five metal arms of the reel are so arranged that they hold even the longest chains in position without overlapping. The large centers give durability, and, with the long handle, provide easy leverage for winding. Nos. 7675A and B have a black finished grip of the usual type, whereas Nos. 7675C and D have a black finished D grip. The grips are hardwood.

The **INVINCIBLE** lines are as described on page 545, and are furnished with two rawhide thongs.

Specify style of end graduation wanted.

7675A.	INVINCIBLE line on Champion reel	No. 7688B,	5/16 in. wide,	50 ft.
7675B.	" " " "	No. 7688B,	" "	100 ft.
7675C.	" " " "	No. 7688C,	" "	200 ft.
7675D.	" " " "	No. 7688D,	" "	300 ft.

Nos. 7675A to 7675D are old Nos. 7706A to 7706D.

For style of end graduations "K", "L" or "M", see page 542.

If so ordered a half-gauge (2 ft 4 1/4 in.) mark will be etched on the line at no extra charge.



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BAND CHAINS.



Riveted and Plated

Riveted and Plated. The graduations are marked by rivets at every foot or fifth of a meter, extra foot or end feet subdivided to 10ths, end meters to decimeters (For style of graduation see page 542). Number marks at every meter or 5th foot, with additional indicators at ever 5th meter or 10th foot. The number plates have rounded edges so that they will not catch in obstructions; and they are notched to insure correct location of the plumb-line.

The line is a heavy ribbon plated with white metal to resist rust. It is a reliable and substantial chain, strong enough for rough work. These band chains are furnished with two rawhide handles.

Specify style of end graduation wanted.

7683 B.	Riveted and Plated Band Chain,	1/4 in. wide,	100 feet
7683 C.	" " " " " "	" "	200 "
7683 D.	" " " " " "	" "	300 "
7683-25.	" " " " " "	" "	25 meters

No. 7683-25 is old No. 7683BM

7683-50.	Riveted and Plated Band Chain,	" "	50 "
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No. 7683-50 is old No. 7683CM

If so ordered a half-gauge (2 ft. 4 1/4 in.) mark is provided, at no extra charge.



Etched

Etched. KECO finish. Etched graduations at every foot, link or meter, extra foot or end feet and end links subdivided to 10ths and 100ths, first meter to centimeters with first decimeter divided to millimeters (For style of graduation, see page 542). The graduations are etched in a manner which insures permanence in rough work. These band chains are furnished with two rawhide handles.

Specify style of end graduation wanted.

7684 B.	Etched Band Chain,	1/4 in. wide,	100 feet.
7684 C.	" " " " " "	" "	200 "
7684 D.	" " " " " "	" "	300 "
7684-6.	" " " " " "	" "	66 " (100 links)

No. 7684-6 is old No. 7684BL

*7684-13.	Etched Band Chain,	" "	132 " (200 links)
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No. 7684-13 is old No. 7684CL

7684-25.	Etched Band Chain,	" "	25 meters
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No. 7684-25 is old No. 7684BM

7684-50.	Etched Band Chain,	" "	50 "
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No. 7684-50 is old No. 7684CM

If so ordered, No. 7684 Band Chains will be etched with a half-gauge (2 ft. 4 1/4 in.) mark, at no extra charge.

*To order only.

For Reels for Band Chains, see pages 548 to 552.

KEUFFEL & ESSER CO., NEW YORK

K & E BAND CHAINS.

REG. U. S. PAT. OFF.



Etched throughout.

Etched throughout. KECO finish. Etched graduations at every foot, 10th and 100th of a foot throughout. Furnished in style "L" graduation and can be furnished with style "M" graduation upon order (See page 542). This chain combines the close division of the tape with the sturdiness of the band chain.

7685B. Etched Band Chain, $\frac{1}{4}$ in. wide, 100 feet.

7685C. " " " " 200 "

WYTEFACE

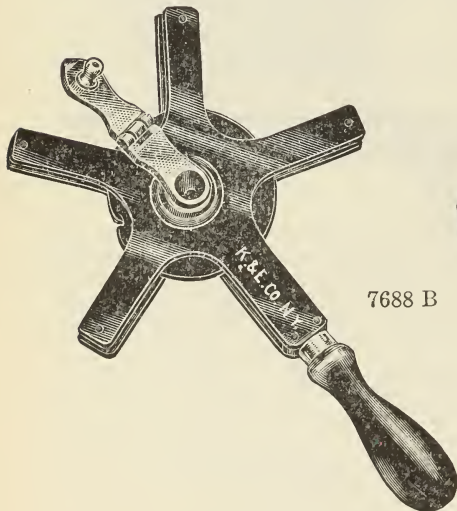
TRADE MARK

W7685B. WYTEFACE Band Chain, similar to No. 7685B but with black graduations on white background, 100 ft. long.

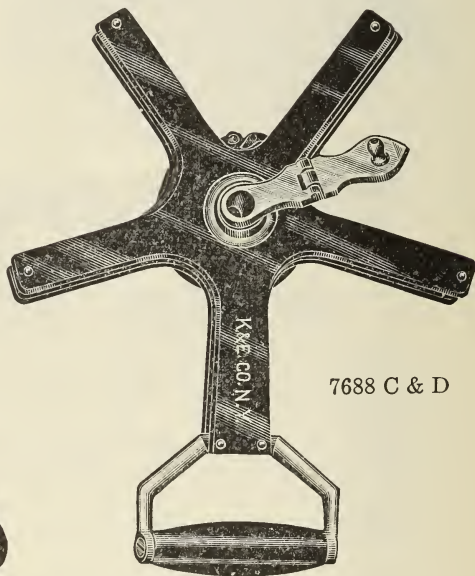
W7685C. WYTEFACE Band Chain, same as No. W7685B, but 200 feet long.

CHAMPION REELS.

TRADE MARK



7688 B



7688 C & D

The Champion Reel has an aluminum frame, with black hardened surface. The five metal arms of the reel are so arranged that they hold even the longest chains in position without overlapping. The large centers give durability, and, with the long handle, provide easy leverage for winding. No. 7688B has a black finished grip of the usual type, whereas Nos. 7688C and 7688D have a black finished D grip. The grips are hardwood.

7688B. Champion Reel for all Band Chains 100 ft., or less, in length, $\frac{1}{4}$ and $\frac{5}{16}$ in. wide.

7688C. " " " " 100 to 200 ft. long, $\frac{1}{4}$ and $\frac{5}{16}$ in. wide, and

No. 7684D, 300 ft. long.

7688D. " " " " 200 to 300 ft. long, $\frac{1}{4}$ and $\frac{5}{16}$ in. wide.

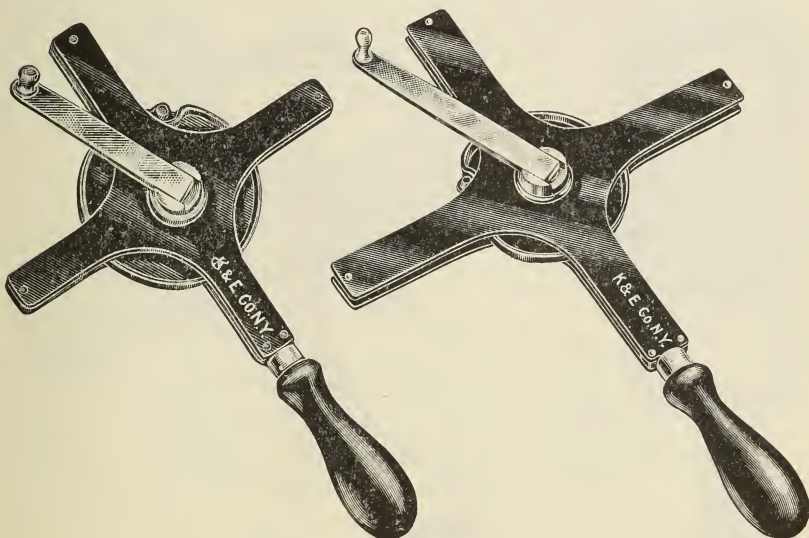
KEUFFEL & ESSER CO. NEW YORK

K & E

REG. U. S. PAT. OFF.

CONQUEROR REELS.

TRADE MARK



No. 7689 B.

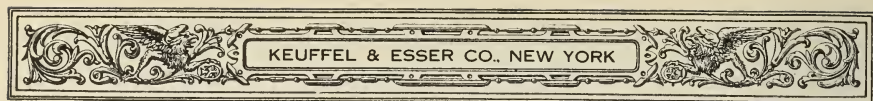
No. 7689 C.

The Conqueror four arm reel is not only durable but handy. It has a strong aluminum frame, with black hardened surface, and a black finished hardwood grip. A long lock handle serves to lock the reel in any position by simply turning over the handle until the knob engages against one of the arms. The drum is exceptionally large, and with the long handle and adequate knob, allows plenty of leverage for ease and speed in winding.

7689 B. Conqueror Reel, for all Band Chains 100 ft. or less in length, $\frac{1}{4}$ and $\frac{5}{16}$ in. wide.

7689 C. Conqueror Reel, for all Band Chains 100 to 200 ft. long, $\frac{1}{4}$ and $\frac{5}{16}$ in. wide.

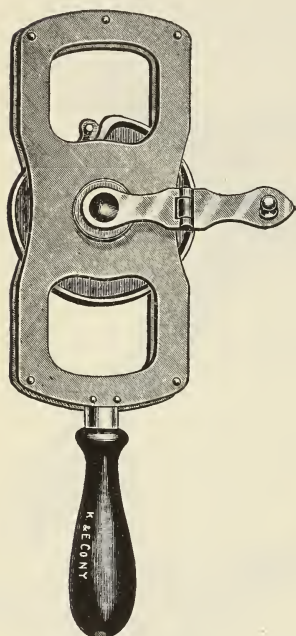
When ordering reel separately, please state for which length of line and kind of graduation.



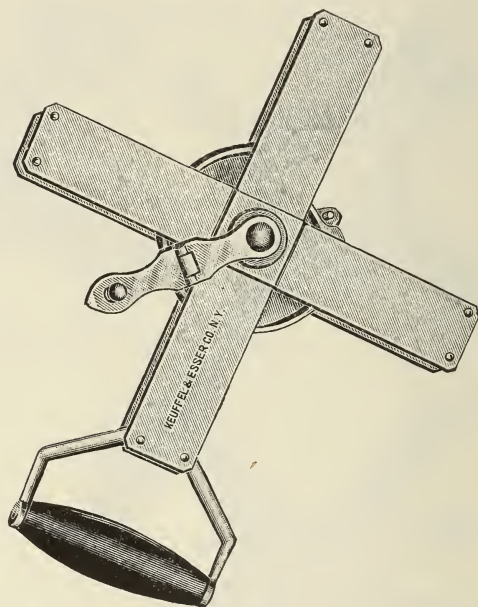
K & E
REG. U. S. PAT. OFF.

IRONCLAD REELS

TRADE MARK



No. 7690 B



No. 7690 C

The Ironclad Reel is of most substantial construction. This very practical reel consists of strong steel plates, carrying a large center (for quick and easy winding) with extra-long folding brass handle. The side plates prevent tangling of the line in reeling and unreeling. All metal parts of the reel are heavily nickelplated. Nos. 7690B has a black finished grip of the usual type, whereas No. 7690C has a black finished D grip. The grips are hardwood.

7690B. Ironclad Reel, for all Band Chains 100 ft. or less in length, $\frac{1}{4}$ and $\frac{5}{16}$ in. wide.

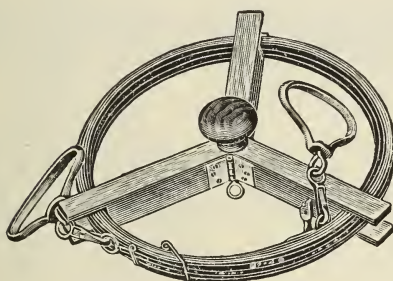
7690C. Ironclad Reel, for all Band Chains 100 to 200 ft. long, $\frac{1}{4}$ and $\frac{5}{16}$ in. wide.

When ordering reel separately, please state for which length of line and kind of graduation.

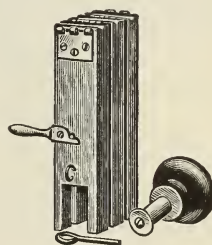
KEUFFEL & ESSER CO., NEW YORK

K & E
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HARDWOOD REELS FOR BAND CHAINS

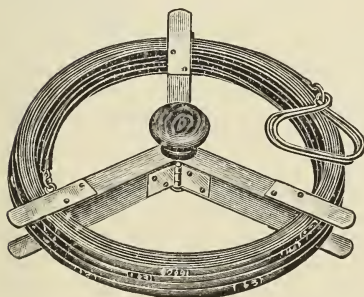


7650 A-1.

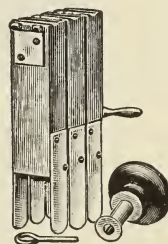


7650 A-1.
Folded

7650 A-1. Folding Reel, hardwood, plain brass handle and hook to hold one end of line when reeling up; spring clamp to prevent line from unreeling. For all Band Chains (pages 543 to 548) up to 200 ft. long; and for Topographic Tapes Nos. 7697-2 and -3 (page 553).



7650 A-3.



7650 A-3. Folded

7650 A-3. Folding Reel, hardwood, similar to 7650 A-1, but reinforced with metal plates. For all Band Chains (pages 543 to 548) 300 ft. long; and Topographic Tape No. 7697-5 (page 553).

REELS ONLY. The lines shown on some of the cuts of the reels are for better illustration.

For reels to carry extra long lines see also page 552.

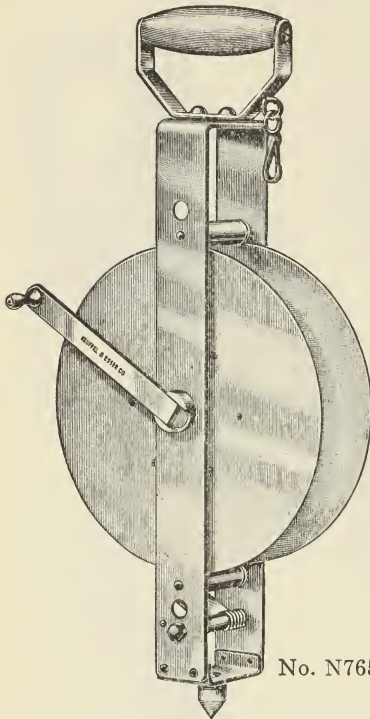
When ordering reels separately, please state for which length of line and kind of graduation.

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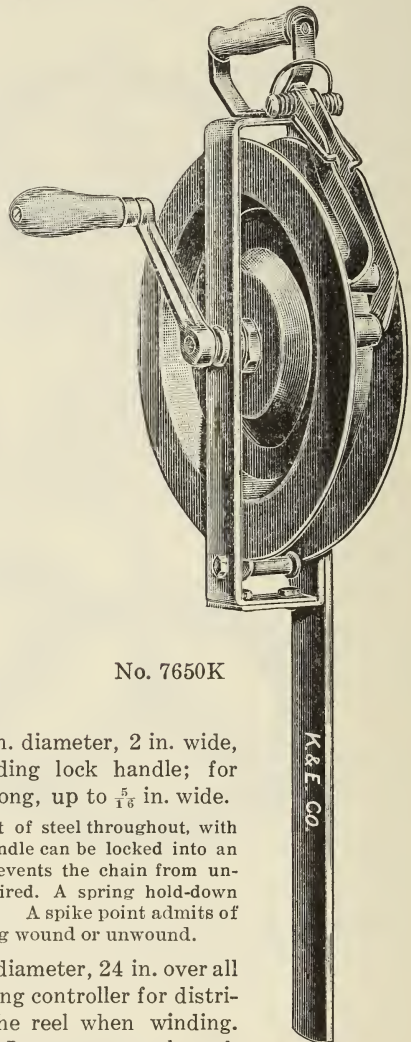
K & E

REG. U. S. PAT. OFF.

REELS FOR EXTRA LONG BAND CHAINS.



No. N7650G



No. 7650K

N7650G. K & E Colorado Steel Reel, 8 in. diameter, 2 in. wide, frame 17 in. long; long folding lock handle; for Band Chains 100 to 500 ft. long, up to $\frac{5}{16}$ in. wide.

The K & E Colorado reel is substantially built of steel throughout, with hardwood supporting grip. A long folding handle can be locked into an opening at either end of the frame and thus prevents the chain from unwinding when only a part of the length is required. A spring hold-down roller keeps the line tightly wound on the reel. A spike point admits of bracing the reel firmly when the tape is being wound or unwound.

7650K. K & E Mine Reel, steel, 10 in. diameter, 24 in. over all with arm extended. Spooling controller for distributing the line evenly on the reel when winding. Large roller to mouth piece. Long stout steel crank with hardwood handle. Weight about 5 pounds. For Band Chains up to $\frac{5}{16}$ in. wide from 300 to 500 feet long (or 90 to 150 meters long.)

The K & E Mine reel will be found very convenient for use in mines. It is of steel and very substantially built. The folding steel arm, when extended, supports the reel while winding the tape, and is folded across the reel when not required.

When ordering please mention kind of tape, also width, and length, for which the reel is intended.



K & E
REG. U. S. PAT. OFF.

TOPOGRAPHIC TAPES



Graduations -- Topographic Tape

The Topographic Tapes, when used in conjunction with the Topographic Abney Level, (see page 356) expedite the labor of chaining in steep and broken country.

7697-2. Topographic Trailer Tape, $\frac{1}{4}$ in. wide, 2 chains (132 feet) with trailer of about 33 feet long. Etched graduations. One side graduated every link for the first two chains, with brass sleeves at the zero, one chain and two chain marks. Beyond the two chain mark is a trailer with graduations proportionated to the graduations of the Topographic Arc. For very steep slopes, the reverse side of the tape is graduated every link for one chain, with a long trailer graduated as described above. each

In using the Topographic Arc and the Trailer Tape, take a slope reading on the Arc, and with the Trailer Tape measure on the slope two chains and as many graduations on the trailer as the Arc reading shows. This distance measured on the slope equals a horizontal distance of two chains. If the same procedure is carried out with the reverse face of the tape, it will give the equivalent location of one chain's distance measured horizontally.

7697-3. Topographic Tape, $\frac{1}{4}$ in. wide, 3 chains (198 feet) long. Etched graduations. One side graduated every link for 3 chains. On the reverse face, behind the 50 link, 1 chain and 2 chain marks, are series of graduations proportionated to the graduations of the Topographic Arc. These graduations are finer than those on No. 7697-2, thus admitting of finer and more accurate work. The method of employing this tape is substantially the same as that described under No. 7697-2. . . . each

7697-5. Topographic Tape, $\frac{1}{8}$ in. wide, 5 chains (330 feet) long. Etched graduations every link, with correction graduations on reverse face as described under No. 7697-3 but behind the 50 link and 1, 2, 3 and 4 chain marks. each

Nos. 7697-2 to -5 are old Nos. 5713-2 to -5.

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K & E

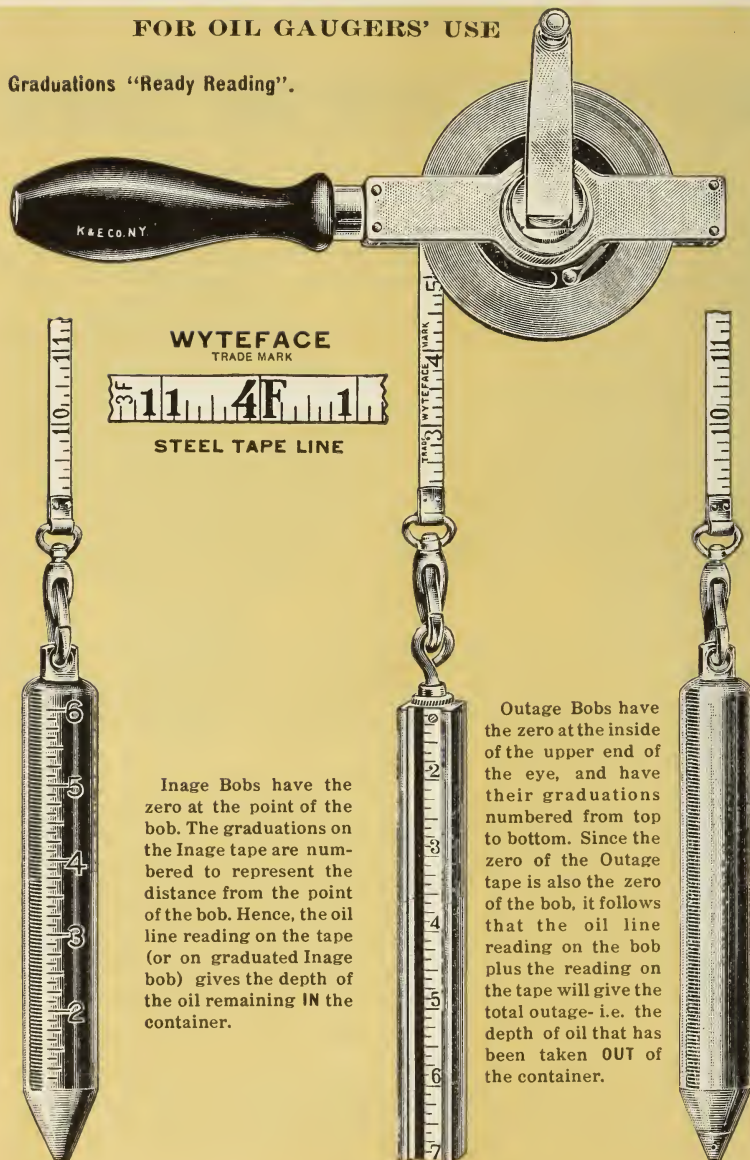
REG. U. S. PAT. OFF.

DALLAS WYTEFACE STEEL TAPES.

TRADE MARK

FOR OIL GAUGERS' USE

Graduations "Ready Reading".



Inage Bobs have the zero at the point of the bob. The graduations on the Inage tape are numbered to represent the distance from the point of the bob. Hence, the oil line reading on the tape (or on graduated Inage bob) gives the depth of the oil remaining **IN** the container.

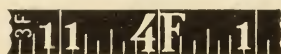
Outage Bobs have the zero at the inside of the upper end of the eye, and have their graduations numbered from top to bottom. Since the zero of the Outage tape is also the zero of the bob, it follows that the oil line reading on the bob plus the reading on the tape will give the total outage- i.e. the depth of oil that has been taken **OUT** of the container.

Inage Line No. W7731
with Inage bob No. 7896-3

Outage Tape No. W7741
with Outage bob No. 7898-1

Inage Line No. W7731
with Inage bob No. 7896-2

All of the lines shown fit the reel illustrated above. See description, page 555.



KECO BLACK FINISH TAPES
with etched graduations will be furnished
if so ordered.



K & E

REG. U. S. PAT. OFF.

WYTEFACE STEEL TAPES.

TRADE MARK

FOR OIL GAUGERS' USE

DALLAS WYTEFACE Steel Tapes for oil gaugers, $\frac{1}{2}$ in. wide, extra heavy divided feet to inches and eighths, on stainless steel frame with lock handle. All mountings nickelplated. Tape runs freely on the reel and can be held in any position by one simple movement of the lock handle. The long lock handle enables the tape, with the plumb bob attached, to be wound up with but little effort. The tape ends in a swivel snap hook.

The Dallas Tape is an exceptionally strong, tough line, with an extraordinarily rugged swivel snap-hook, carried in a frame that gives a maximum of resistance to wear and rough handling. See illustration page 554.

DALLAS WYTEFACE INAGE TAPES.

TRADE MARK

Zero of line about $6\frac{3}{4}$ inches outside of outer end of swivel snap hook—
i. e. at point of an inage bob.

Length in feet	Lines on reel, without plumb bob	Lines only, without reel or plumb bob
33	No. W 7721	No. W 7731
50	W 7722	W 7732

Tapes complete, with reel and Inage bob (see pages 554 and 560.)

W 7721 (33 ft.)	with 7896-1, 20 oz., not graduated	complete
	with 7896-2, 20 oz., not graduated, removable hard metal tip	"
W 7722 (50 ft.)	with 7896-3, 20 oz., graduated	"
	with 7896-8, 8 oz., graduated	"

DALLAS WYTEFACE OUTAGE TAPES.

TRADE MARK

Zero of line at inside of lower end of swivel snap hook.

Length in feet	Lines on reel, without plumb bob	Lines only, without reel or plumb bob
33	No. W 7741	No. W 7751
50	W 7742	W 7752

Tapes complete, with reel and Outage bob (see page 554.)

W 7741 (33 ft.)	with 7898-1 (see page 560)	complete
W 7742 (50 ft.)	with 7898-1 (see page 560)	"

KEUFFEL & ESSER CO., NEW YORK

K & E

REG. U. S. PAT. OFF.

TULSA WYTEFACE STEEL TAPES.

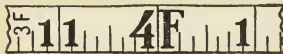
TRADE MARK

FOR OIL GAUGERS' USE

Graduations "Ready Reading."



WYTEFACE
TRADE MARK



STEEL TAPE LINE

Inage Bobs have the zero at the point of the bob. The graduations on the Inage tape are numbered to represent the distance from the point of the bob. Hence, the oil line reading on the tape (or on graduated Inage bob) gives the depth of the oil remaining **IN** the container.

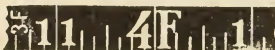
Outage Bobs have the zero at the inside of the upper end of the eye, and have their graduations numbered from top to bottom. Since the zero of the Outage tape is also the zero of the bob, it follows that the oil line reading on the bob plus the reading on the tape will give the total outage-i.e. the depth of oil that has been taken **OUT** of the container.

Inage Line No. W 7811
with Inage bob No. 7896-1

Inage Tape No. W 7801
with Inage bob No. 7896-3

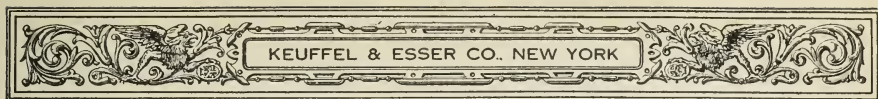
Outage Line No. W 7831
with Outage bob No. 7898-1

All of the lines shown fit the reel illustrated above. See description, page 557.



KECO BLACK FINISH TAPES

with etched graduations will be furnished if so ordered.



K & E
REG. U. S. PAT. OFF.
WYTEFACE STEEL TAPES.
TRADE MARK

FOR OIL GAUGERS' USE.

TULSA ^{TRADE MARK} WYTEFACE Steel Tapes for oil gaugers, $\frac{3}{8}$ in. wide, divided feet to inches and eighths, on aluminum frame, black hardened surface, with lock handle. All mountings nickelplated. Tape runs freely on the reel, and can be held in any position by one simple movement of the lock handle. The long lock handle enables the tape, with the plumb bob attached, to be wound up with but little effort. The tape ends in swivel snap hook. See illustration, page 556.

TULSA WYTEFACE INAGE TAPES.
TRADE MARK

Zero of line about $6\frac{1}{4}$ inches outside of outer end of swivel snap hook—
i. e. at point of an inage bob.

Length in feet	Lines on reel, without plumb bob	Lines only, without reel or plumb bob
33	No. W7801	No. W7811
50	W7802	W7812

Tapes complete with reel and Inage bob (see pages 556 and 560).

W7801 (33 ft.)	{	with 7896-1, 20 oz., not graduated	complete
		with 7896-2, 20 oz., not graduated, removable hard metal tip.	"
		with 7896-3, 20 oz., graduated	"
		with 7896-8, 8 oz., graduated	"
W7802 (50 ft.)			

TULSA WYTEFACE OUTAGE TAPES.
TRADE MARK

Zero of line at inside lower end of swivel snap hook.

Length in feet	Lines on reel, without plumb bob	Lines only, without reel or plumb bob
33	No. W7821	No. W7831
50	W7822	W7832

Tapes complete with reel and Outage bob (see page 556).

W7821 (33 ft.)	with 7898-1 (see page 560).	complete
W7822 (50 ft.)	with 7898-1 (see page 560).	"

KEUFFEL & ESSER CO., NEW YORK

K & E

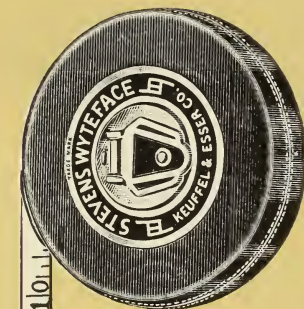
REG. U. S. PAT. OFF.

STEVENS WYTEFACE STEEL TAPES.

TRADE MARK

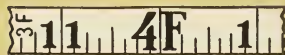
FOR OIL GAUGERS' USE

Graduations "Ready Reading"



WYTEFACE

TRADE MARK



STEEL TAPE LINE

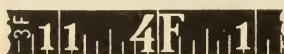
Inage Bobs have the zero at the point of the bob. The graduations on the Inage tape are numbered to represent the distance from the point of the bob. Hence, the oil line reading on the tape (or on graduated Inage bob) gives the depth of the oil remaining **IN** the container.

Stevens Inage Tape No. W 7882
with Inage bob No. 7896-8



Outage Bobs have the zero at the inside of the upper end of the eye, and have their graduations numbered from top to bottom. Since the zero of the Outage tape is also the zero of the bob, it follows that the oil line reading on the bob plus the reading on the tape will give the total outage- i.e. the depth of oil that has been taken **OUT** of the container.

Stevens Tape No. W 7352T
with Outage bob No. 7898-3
for Outage Measurements



KECO BLACK FINISH TAPES, $\frac{3}{8}$ in. wide.
with etched graduations and brown leather case embossed "HOME" will be furnished if so ordered.



K & E

REG. U. S. PAT. OFF.

WYTEFACE STEEL TAPES.

TRADE MARK

FOR OIL GAUGERS' USE

STEVENS WYTEFACE Steel Tapes for oil gaugers, $\frac{3}{8}$ in. wide, stout bent black leather case, large center, long folding self-opening handle. Patented friction brake. Chromium-plated mountings. Divided to feet, inches and eighths.

STEVENS WYTEFACE INAGE TAPES.

TRADE MARK

Zero of line about $6\frac{3}{4}$ inches outside of outer end of swivel snap hook—
i. e. at point of an inage bob.

Length in feet

Line in Case without
plumb bob

50 No. W7882

Tape complete with Case and Inage bob (see pages 558 and 560).

W7882 (50 ft.)	{	with 7896-1, 20 oz., not graduated complete
		with 7896-2, 20 oz., not graduated, removable hard
		metal tip "
		with 7896-3, 20 oz., graduated "
		with 7896-8, 8 oz., graduated "

STEVENS WYTEFACE OUTAGE TAPES.

TRADE MARK

Zero of line at outside end of ring.

Length in feet

Line in Case without
plumb bob

50 No. W7352T

Tape complete with Case and Outage bob (see page 558).

W7352T with 7898-3 (see page 560). complete

K & E WYTEFACE

REG. U. S. PAT. OFF.

TRADE MARK

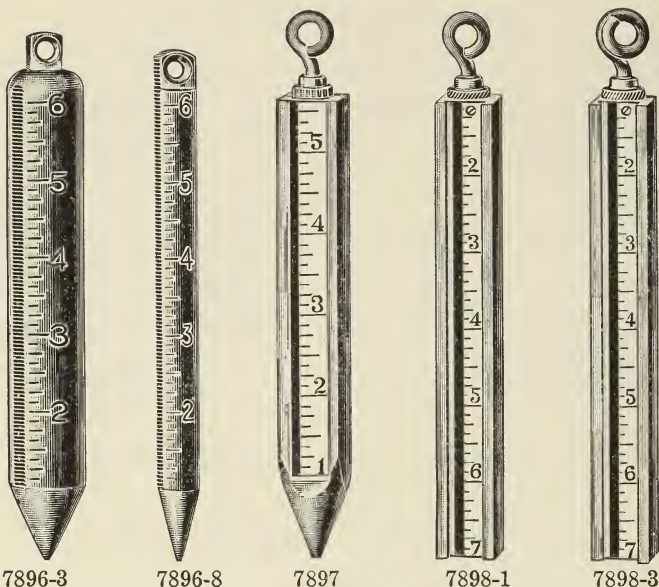
TANK STRAPPING TAPES

Any K & E Steel Tape, $\frac{1}{4}$ in. wide, is suitable for tank strapping, and those 100 ft. long, divided to feet, 10ths and 100ths ft., meet the specifications of the American Petroleum Institute Measuring Code. The Maine WYTEFACE tape No. W7175 $\frac{1}{2}$ D, described on page 514, is especially recommended for this purpose.

KEUFFEL & ESSER CO., NEW YORK

K & E
REG. U. S. PAT. OFF.

OIL GAUGERS' PLUMB BOBS.



OIL GAUGER'S INAGE PLUMB BOBS.

For determining the contents of tanks.

- 7896-1. Oil Gauger's Plumb Bob, brass, 1 in. dia. \times $6\frac{3}{4}$ in. long. Not graduated, but section of surface rifled to hold oil. Weight 20 oz.
- 7896-2. Oil Gauger's Plumb Bob, like No. 7896-1, but with removable hard metal tip.
- 7896-3. Oil Gauger's Plumb Bob, like No. 7896-1, but graduated upward in inches and eighths, with zero at point of bob.
- 7896-8. Oil Gauger's Plumb Bob, brass, $\frac{1}{2}$ in. dia. \times $6\frac{3}{4}$ in. long. Weight 8 oz. Graduated upwards in inches and eighths, with zero at point of bob.
- 7897. Oil Gauger's Plumb Bob, brass, $\frac{3}{4}$ in. face, about $6\frac{3}{4}$ in. over all. Weight 16 oz. Graduated on WYTEFACE insert (black graduations and numbers on white background), numbered upward in inches and eighths, with zero at point of bob.

OIL GAUGER'S OUTAGE PLUMB BOBS.

For determining tank outages.

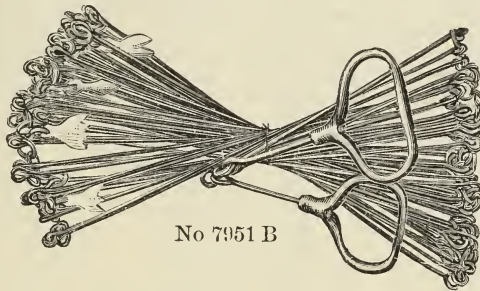
- 7898-1. Oil Gauger's Plumb Bob, brass, $\frac{3}{4}$ in. face, about 7 in. over-all. Weight 20 oz. Graduations on WYTEFACE insert (black graduations and numbers on white background), numbered from top downward, with zero at the inside of the top of the eye.
- 7898-3. Oil Gauger's Plumb Bob, brass, similar to No. 7898-1, but with eye designed for tape on which zero is at the outside end of the ring.

KEUFFEL & ESSER CO., NEW YORK

K & E

REG. U. S. PAT. OFF.

MEASURING CHAINS.



No 7951 B

STEEL, U. S. STANDARD.

7950A.	Steel,	W. G. 12,	Brass Handles,	oval rings,	50 feet
7950B.	"	"	"	"	100 "
7950C.	"	"	"	"	33 " (50 Links)
7950D.	"	"	"	"	66 " (100 Links)
7951B.	"	"	"	brazed links and rings,	100 feet
7951D.	"	"	"	"	66 " (100 Links)

Chain No. 7951 B has a spring hook (snap) at 50 feet, so that it can be separated there and the handle attached for using it as a 50-foot chain.

Nos. 7950A to 7951D are old Nos. 7780A to 7781D.

STEEL, METER AND VARA.

7952A.	Steel,	W. G. 12,	Brass Handles,	oval rings,	10 meters
7952C.	"	"	"	"	20 "
7953A.	"	"	"	brazed links and rings,	10 meters
7953C.	"	"	"	"	20 "
7955B.	"	"	"	"	20 varas

The Vara Chains are in Mexican Varas (838 mm). Chains in Varas of other Standards furnished to order.

Nos. 7952A to 7955B are old Nos. 7782A to 7785B.

IRON, U. S. STANDARD.

7956B.	Iron,	W. G. 8,	Brass Handles,	2 round rings,	100 feet
7956D.	"	"	"	"	66 " (100 Links)

Nos. 7956B and D are old Nos. 7786B and D.

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The enclosed price list is intended for use in conjunction with the 38th edition of the **K & E** General Catalog, which you have in your possession.

We would suggest that you remove the old price list found in the pocket attached to the rear cover of our catalog, and replace it with the enclosed one.

At this time, we wish to thank you very much for the consideration you have given to our merchandise, and we hope that we may have the pleasure of continuing to serve you for many years to come.

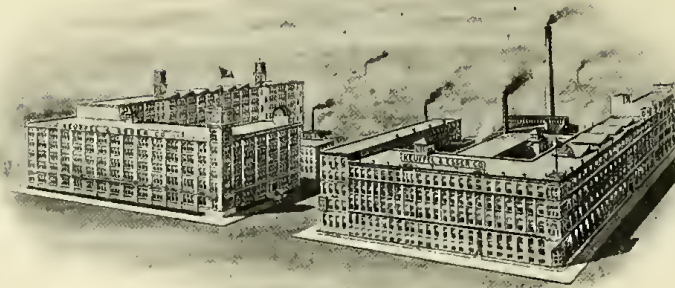
KEUFFEL & ESSER CO.

GENERAL OFFICE AND FACTORIES: HOBOKEN, N. J.



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ESTABLISHED 1867

HOBOKEN, N. J.

ADAMS & THIRD STREETS

March 19, 1937

Gentlemen:

Due to rising costs we have found it necessary to increase the prices on some of our Slide Rules, and are enclosing a price list dated Feb. 20th showing the current list prices.

This supersedes the March 1st, 1936 price list and the prices printed in the Slide Rule catalogue.

Your discount, of course, remains the same as heretofore.

Yours very truly,

KEUFFEL & ESSER CO.

Sales Manager

THE COMPUTER HISTORY MUSEUM



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